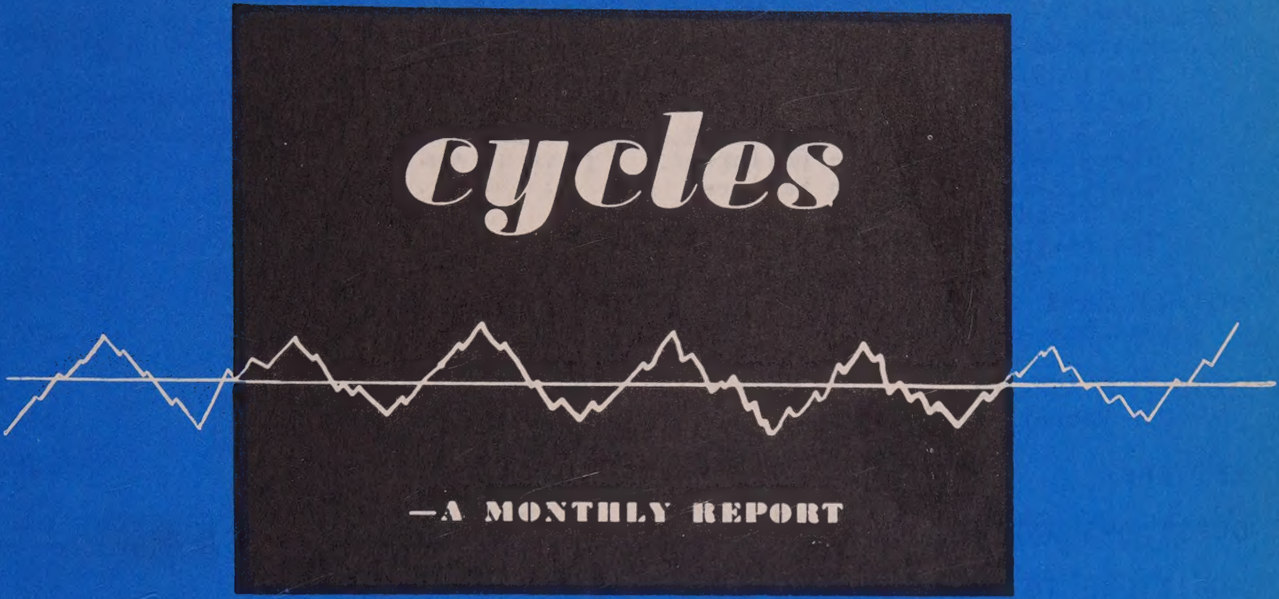

cycles

—A MONTHLY REPORT

October 1953

FOUNDATION FOR THE STUDY OF CYCLES
New York, New York

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VOLUME IV NUMBER 8 OCTOBER 1953

The Director's Letter

Dear Member:

In making plans for the future you will do well to consider World War III as *inevitable*.

A Chart of Battles, 599 B.C. to Date

On the wall of my study I have a frieze —or at least I did have until I got tired of looking at it—which shows every single battle of recorded history, year by year, from 599 B.C. to 1952 A.D. For each year little battles are shown by short blocks ▬, medium sized battles are shown by medium length blocks ■, and major engagements are shown by long blocks █. These blocks, piled on one another, create for each year a long bar which constitutes the index for that year.

As a matter of fact the frieze, which is about 16 feet long, has two bars for each year. One bar gives a measure of international battles. The other bar gives a measure of civil war battles. It is interesting that the heights of the two bars more or less alternate. That is, when there are lots of civil war battles, international battles tend to decrease, and vice versa.

The frieze is made up of enlargements of charts prepared by Dr. Wheeler of the University of Kansas. I published these charts for you in our report for February 1951.

Battles in the Future Inevitable

One look at the frieze to which I referred above should convince anyone (except a wishful thinker) that behavior patterns (i.e. lots of international battles, year after year) which have persisted for over 2500 years will not change over night. We *will* have lots of international battles in the future.

Cycles in War

If the study of cycles teaches us anything it teaches us that things *fluctuate*. When we have good times we can be sure that bad times will follow. When we have bad times we can be sure that good times will follow. When we have war we can count for sure, on peace. When we have peace we can count, for sure, on war.

Now, as I have told you at various times, study of the ups and downs of the number and/or severity of international battles shows that this behavior tends to fluctuate in cycles. The most important cycle is a little over 22 years in length. It is due for strength—i.e. more than an average number of international battles—in the period 1957—1968. If we add in the effect of another cycle in international war, which is 11.2 years long, these dates get advanced a little.

If you will refer to the chart I printed for you in my report for June 1952, you will see that *ideally* the end of 1952 is at the very trough of the cycle, and that the probabilities favor an increasing number of international battles, year by year, from that time forward. "Ideally" a crest will be reached in the early 1960's.

In this connection, remember that the outbreak of war generally *preceeds* the maximum number of battles by a fair amount of time. Every day brings war just one day closer. Do not get caught unprepared, mentally or otherwise.

However, my purpose here is not to try to date the next peak in the number of international battles, but to plead with you to recognize the fact that, sooner or later, a very large number of such battles is *inevitable*.

"Inevitable"

At this point I would like to say a few words about the word "inevitable." Many able persons have declared that World War III is not inevitable. Are they fools, or knaves? Neither. They are using the word with a different meaning. It is proper to work for peace. There is no need for us to take a defeatest attitude. Miracles have happened. Miracles could happen again. You, for example, *might* live to be 110 years old. It is not *impossible*. I am sure you are going to try, or die in the attempt. But it is so unlikely that, as a practical matter, the possibility is hardly worth taking into account.

So, when someone says that war is *not* inevitable you can accept this statement to be true in the same way you would accept it if he said that your death before 110 years of age is not inevitable. Theoretically both are true statements, but, as a *practical* matter both are false. You will *not* live to be 110; war *is* certain.

Let us stop wishful thinking and face realities.

Speaking as a Layman

I suppose I should stop these observations at this point, because when we get away from the subject of cycles I speak with no more authority than anyone else. I know no more than you about the nations between whom these coming international battles will be fought, whether we will be involved; if so, whether or not our cities will be atom-bombed, and, if they are, what the consequences will be. I know no more than you as to what you might do to protect yourself and your family. Therefore, I should probably not express myself in regard to these matters in these pages.

Nevertheless, in the thought that it might be helpful, I would like to make the following observations:

Ourselves vs. Russia

I believe we are certain to be involved in the international battles to come and that a major number of these battles will be between Russia and ourselves.

Ten years ago there were four great military powers in the world: from west to east the Germans, the Russians, the Japanese, and ourselves. We were protected from serious damage from Germany by the Atlantic Ocean at her front and Russia at her back. Similarly, we were protected from serious damage by the Japanese by the Pacific Ocean at her front and Russia at her back. From Russia we were protected by the Germans on one side and Japanese on the other. We were in an ideal situation with three great military powers who could be counted upon to keep each other occupied for generations to come.

Then came the war with Germany and the war with Japan.

So what do we do? We call for "unconditional surrender," making any deal with either Germany or Japan impossible. We then proceed to beat Germany to a pulp and to emasculate Japan. We then kill Germany outright as a military power by consenting to her complete partition. By thus disposing of the only two possible powers that could contain Russia we find ourselves looking over the fence directly into the face of the big black bear herself!

Atom Bombs Away!

I believe we will be atom-bombed, and thoroughly. That is, I believe we will wake up some fine morning and find ourselves lacking perhaps one hundred of our largest cities, except for tag ends.

Many people believe that the atom will not be used by either side in the coming international battles. They argue by analogy from the fact that poison gas was not used by either side in the last war.

Such people may be right, but I do not think so. Take your choice—it's *your* life.

I believe that it will be a long hard war, leaving us spent at the end of it, win or lose.

I believe that, as a result of bombing, our productive facilities will be *seriously* impaired, to *under*state the situation as much as possible.

Bare Essentials for Civilians

I believe that there will be very little in excess of bare essentials for the civilian population during the war and for many years after.

I believe that immediately after bombing the dislocation of transport may cause temporary food shortages, particularly in what is left of our large urban centers, and that some people will die of starvation.

Holding these beliefs it seems to me only prudent for the individual citizen to lay up a stock, as best he can, of the essentials for living to carry him through a possible period of stress and privation. In this way he can not only fulfill his obligations to himself and his family but can ease the strain of his support upon the economy as a whole at a time when the country will be fighting for its life.

The policy of Joseph, the first cycle analyst, of laying up in the 7 years of plenty for the 7 years of famine to follow could well be followed today by our citizens, by out industrial companies, and by our government.

Keep Everything in Tip-Top Shape

Perhaps I should be more specific:

I believe that if you own a farm, for example, you should have your fences in the best possible condition, and that you should have a reserve supply of fencing. Once war starts, it may be impossible to buy fencing for many years to come. You should have your buildings in the best possible state of repair. Once war starts, it may be impossible to buy paint or roofing or building materials, or to secure the labor to make repairs. For the same reason, I believe that you should have a reserve stock of tools so that you can carry on with your essential activities regardless of availability of such items in the stores.

If you are a householder, the same admonitions apply. Have everything in tip-top shape and keep it so. The new roof you put on this year or the next may be the last that you will be able to apply for years and years to come,—for your lifetime perhaps.

I understand that a reasonably effective bomb shelter for private houses can be built quite inexpensively. I believe that householders who live in target areas should build them.

Manufacturers Can Be Prudent, Too

If you are a manufacturer located in a large city, keep extra blueprints of your plant and all your various products in some place of storage outside of the city limits. Bomb-proof vaults, seem to me, are ridiculous, except for the most valuable possessions. Any small town is reasonably safe from atomic bombing. I doubt if more than the hundred largest cities will get it.

If you are a housewife, and have the necessary storage facilities, do not throw away your old clothes. That old suit with the hole in it, that your husband would not be seen dead in, may someday be useful as his Sunday-go-to-meeting best. That old worn-out sheet may someday serve as a very welcome bandage.

Do not bother to buy things like extra electric irons because there will probably be little or no electric current for anything except for essential use. But an extra supply of the *essentials*, that you really cannot live without, might someday come in very handy indeed.

A Shack in the Country

If you can afford it, and you live in a large city, a little shack in the country might not be a bad idea, especially if it were stocked with the essentials of living (food and warmth) and a means to protect yourself in the possession of these things against those who have not been so forethoughtful.

Financial Dislocations

I believe that extensive bombing of our industrial areas will cause serious financial complications, that moratoria will probably be declared, that withdrawals from such banks as are left will be limited, and that eventually, after the war is over, win or lose, the government debt will be repudiated.

To protect yourself against the financial dislocation, which I believe will follow bombing, may take a little thought. The basic idea might well be that pieces of paper will neither feed you, clothe you, shelter you, nor protect you from marauders.

Commodities vs. Money

In other words it seems to me that, following an intensive atom bombing, money will be of very little value. You must think in terms of *commodities* that can be put to use, rather than in terms of pieces of paper which, in final analysis, are useful only to light fires with, unless somebody will give you tangible commodities in exchange for them.

On the other hand, it will do you no good to convert your wealth into tangible commodities such as copper, because, in a time of crisis, your sense of patriotism would force you to turn such stocks over to the government (and if it did not, the government's sense of patriotism would).

Therefore, as I said above, the safeguarding of wealth is going to require a little thought.

I could go on at considerable length, but you should be able to figure out as well as I what would happen if tomorrow morning most of our large industrial centers were simply not there, and if *all* remaining resources, except those absolutely necessary for bare essentials, were diverted for military purposes.

It Is the Way of Life

I see no cause for panic in these prospects. It is the way of life. It is the way of nature. It is the way things always have been, it is the way things are, and it is the way things are going to be for a long time to come. We did not get to the top of the heap first as animals and second as a nation by being cowards and weaklings. We may be a bit soft on the surface, but underneath we are stout hearted and made of good stuff. We will come through. But with a little forethought we may come through somewhat more comfortably and effectively, and with somewhat less burden upon our neighbors.

War is Certain: The Consequences Suggested Above Are Opinions

Now in closing let me distinguish again between those areas of knowledge in which I have some competence and those in which I am a layman. Within my field of competence my opinion should carry weight, just as your doctor's opinion should carry weight in the field of medicine—your lawyer's opinion should carry weight in the field of law.

Within this field I say categorically (a) there will be many international battles in the future, (b) there will be sizable fluctuation from year to year in the number of such battles, and (c) a more than average of such battles lies ahead of us in the not too distant future. Beyond that I am a layman. If you can get better advice than I have given you, do so. After all, as I said above,—it is your life.

Cordially yours,

Edward R. Dewey

Director

Research

BUSINESS FAILURES

Liabilities of Commercial and Industrial Failures

in the United States, 1857—1953

CYCLES, TREND, AND FORECAST

The 17¾-Year Cycle in Failures

"WHY is it," I recently asked a friend, "that people seem so much more interested in depressions than in war. War is ever so much more important."

"Maybe you have never been hungry," my friend replied.

Be that as it may, there is no argument about the fact that depressions *are* important, however you look at it.

One measure of depression is unemployment. Another measure is production—or lack of it. A third measure is the number and/or the liabilities of commercial and industrial failures. This last named index, however, is *in part* a measure of price fluctuations. There are other measures, too. But in this article I shall discuss liabilities of commercial and financial failures.

In our report for December, 1951, I told you of a 17 3/4-year cycle in commercial and industrial failures which has repeated itself a little over five times in the available data (1857-1953).

A cycle *could* repeat five times by accident. If the 17 3/4-year cycle in failures is present merely by happenstance it will of course not continue. But there are reasons for believing that it *is* significant and that it *will* continue.

One of these reasons is the fact that in pig iron prices, as we go backward in time, this cycle keeps on coming true for four more cycles--which is as far back as figures are available. In cotton prices this cycle is clearly evident back still further (cotton prices go back to 1731). And in tree rings a cycle of this length is present on the average back to 1100 A.D. (45 cycles), which is as far back as these figures have been studied for this cycle.

Readers of these reports will remember other examples of cycles of this length (sunspots with alternate cycles reversed, industrial common stocks, etc.).

Another reason for believing in the significance of a cycle in this length is that a cycle averaging this length, called a cycle of panics, was observed as far back as 1873 (see Foundation Reprint No. 24). Insofar as the cycle of liabilities of commercial and financial failures and the cycle of panics may be considered to be one and the same thing, this cycle *has kept on coming true* for the 80 years since discovery, except for the last peak which seems to have been turned completely topsy turvy by World War II.

My own belief is that this cycle is significant and that it can be ignored only at our peril.

The average amplitude (height at peak or depth at trough) of the 17 3/4-year cycle in commercial and industrial failures is 51% above trend at crest and 34% below trend at trough. This is a very sizable and important variation.

The time of crest in the ideal 17 3/4-year cycle is the mid-point of 1893 and at 17 3/4 year intervals forward and backward from that time. This timing puts the last crest of the ideal 17 3/4-year cycle in 1946, the next crest at mid-1964.

The 17 3/4-year cycle in failures is

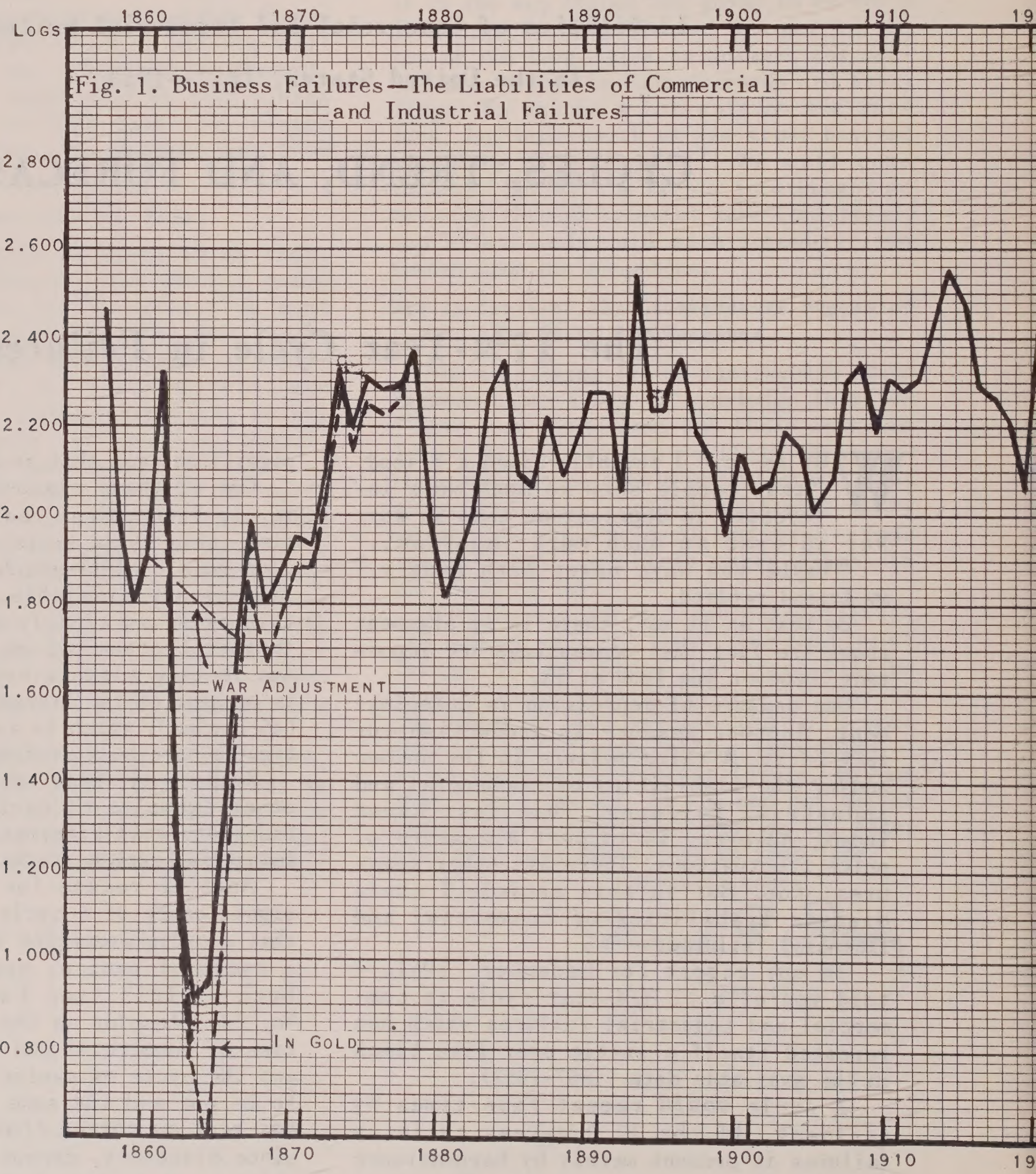
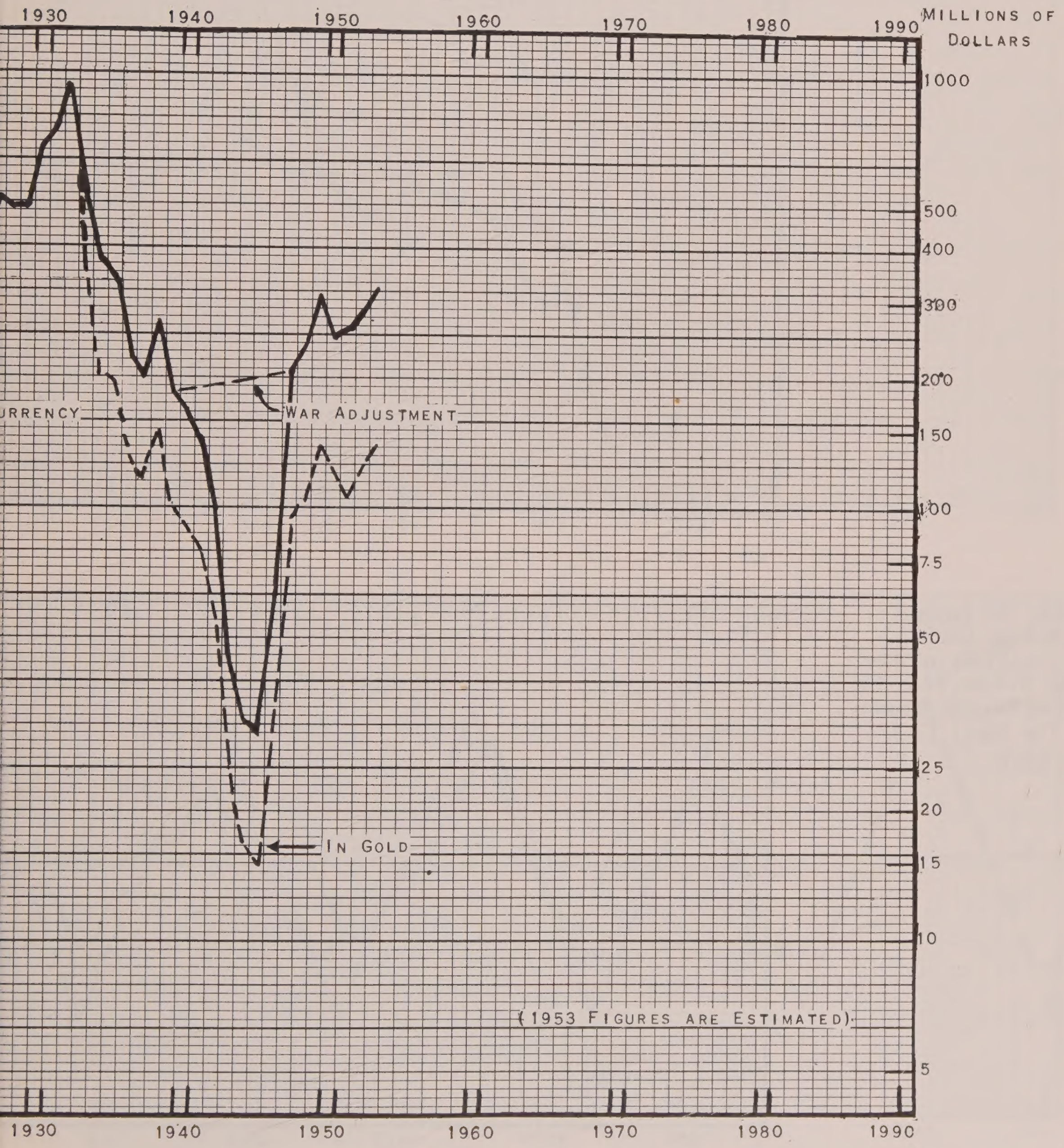


Fig. 1. Business Failures—The Liabilities of Commercial and Industrial Failures

symmetrical. The lows of the ideal cycle therefore come 8 3/8 years after crest. Consequently the current low of the ideal cycle falls in 1955.

This cycle in these figures can be seen most clearly if we smooth the actual data adjusted for war distortion (Fig. 1) by a 9-year moving average (Fig. 2) and compare the smoothed figures with an 18-year moving average trend (Fig. 3).

A diagram of the 17 3/4-year cycle in commercial and industrial failures 1857 to date, and a projection of it to 1990, is shown as Curve E of Fig. 10.



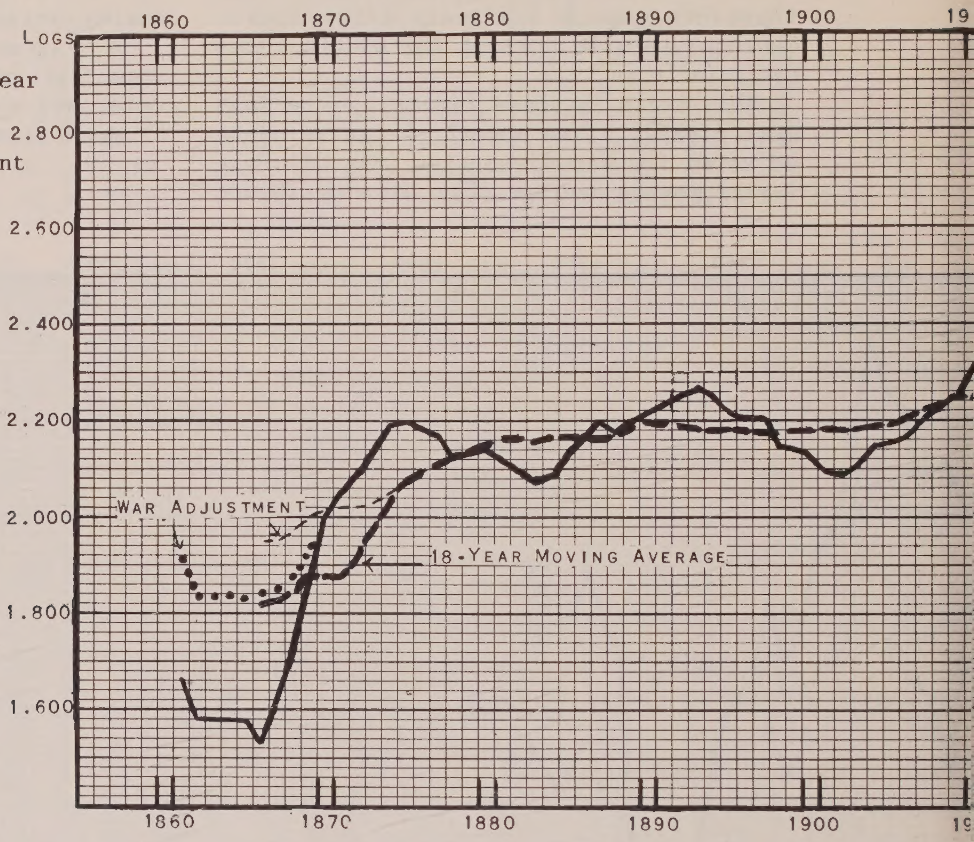


Fig. 2. Business Failures--
The 18-Year and the 9-Year
Moving Average of the
Data (Showing also the
Result of the Adjustment
for Civil War and
World War II)

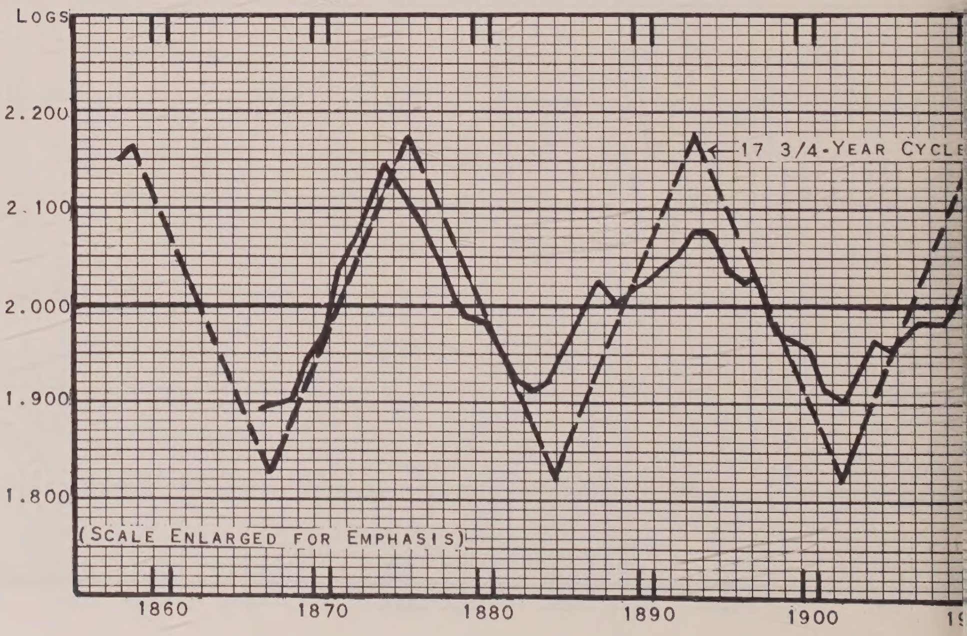
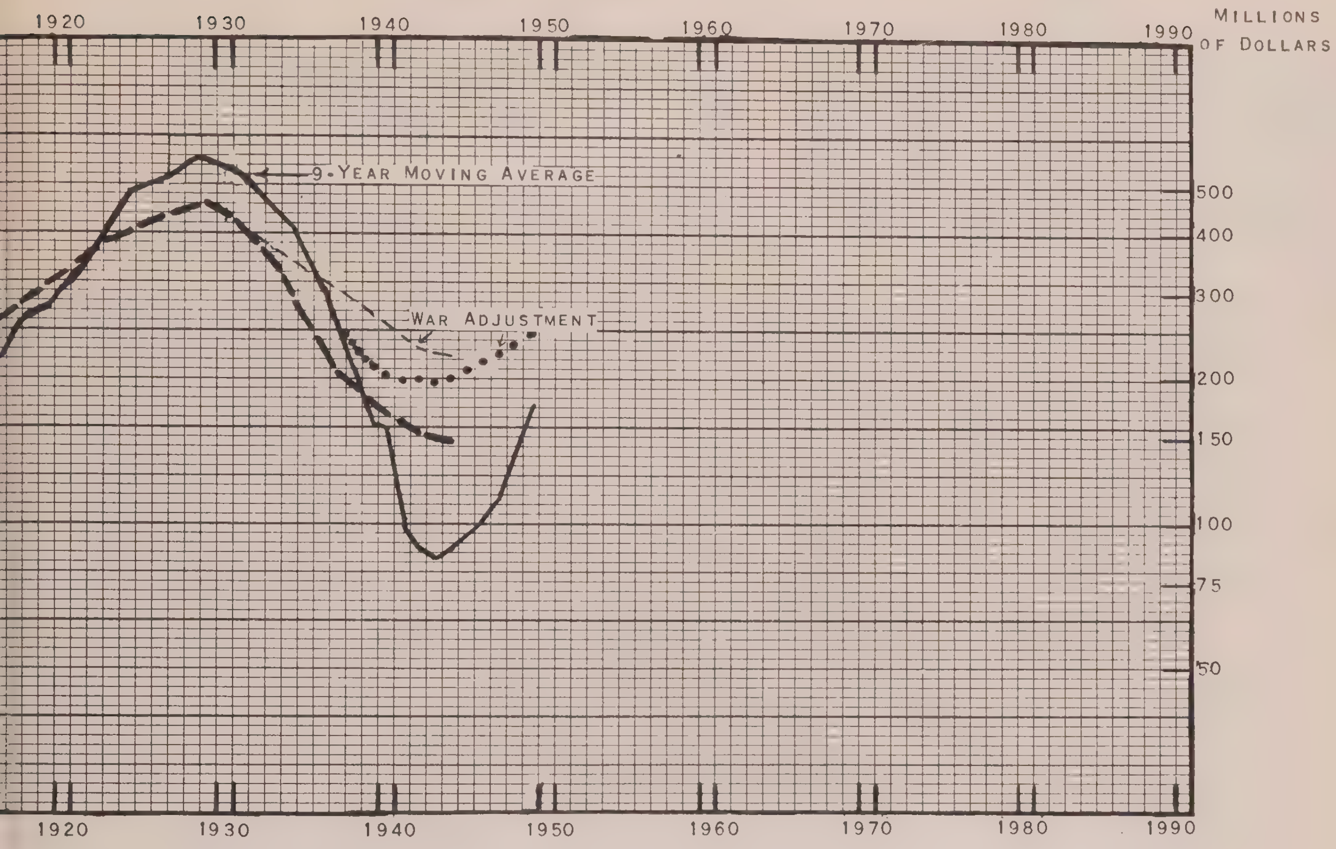
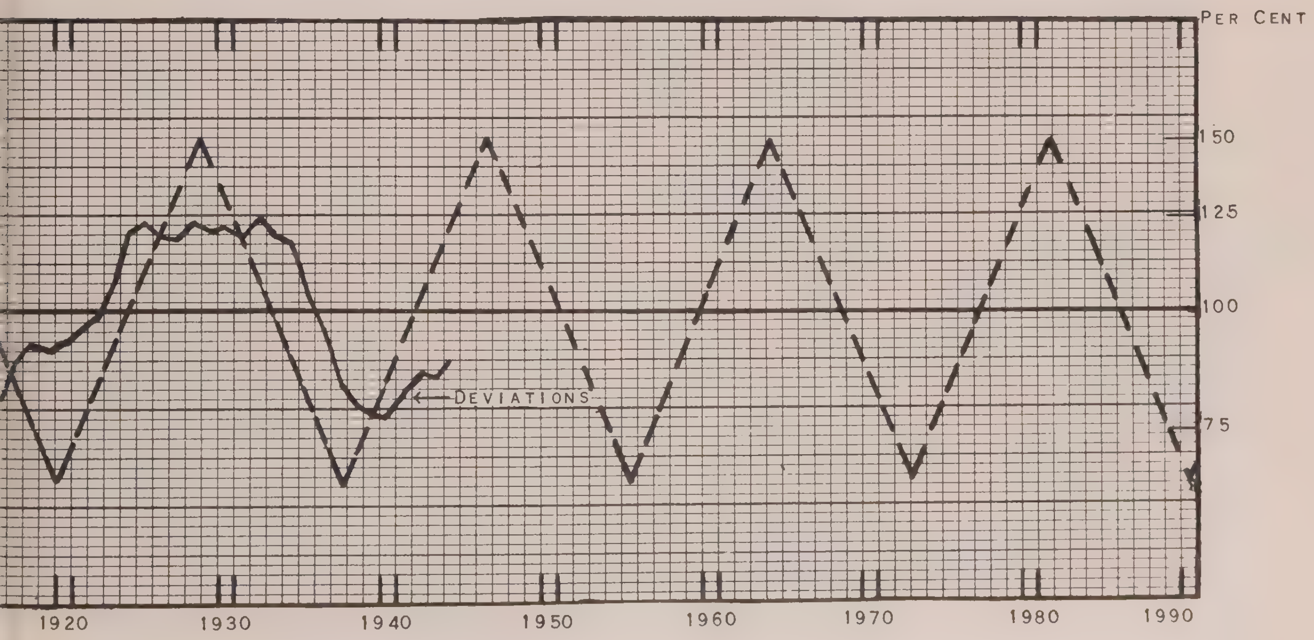


Fig. 3. Business Failures--
17 3/4-Year Cycle.
The Deviations of the
of the 9-Year from the
18-Year Moving Average
and the Ideal 17 3/4-
Year Cycle


MILLIONS OF DOLLARS
9-YEAR MOVING AVERAGE
WAR ADJUSTMENT
500
400
300
200
150
100
75
50
1920
1930
1940
1950
1960
1970
1980
1990


PER CENT
DEVIATIONS
150
125
100
75
1920
1930
1940
1950
1960
1970
1980
1990

The 9.2-Year Cycle in Failures

IN addition to the 17 3/4-year cycle, the liabilities of commercial and industrial failures have shown a 9.2-year cycle from 1857 to date.

There has been time for nearly ten repetitions of a cycle of this length in these figures. Such behavior can not occur easily as a result of random forces.

There have been so many accounts in these pages of a cycle which is slightly over 9 years in length that it seems hardly worth while to relist them here.

You can see this cycle in liabilities of commercial and financial failures most clearly if we smooth the data by a 5-year moving average to eliminate the shorter

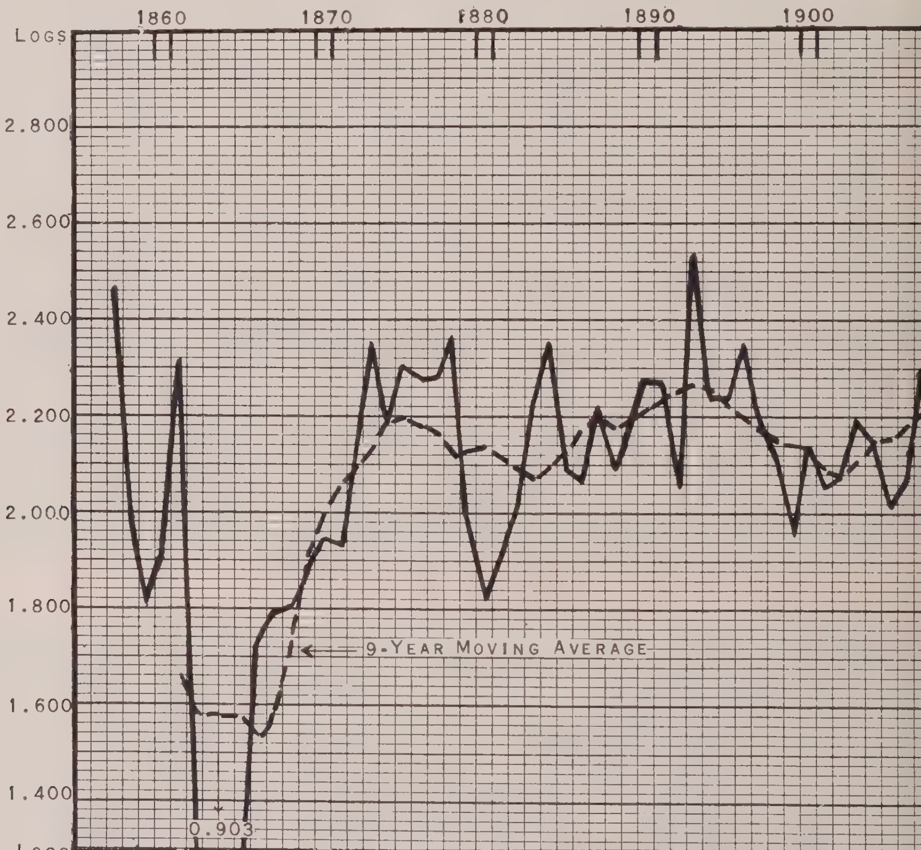


Fig. 4. Business Failures--Liabilities of Commercial and Industrial Failures and the 9-Year Moving Average of the Data

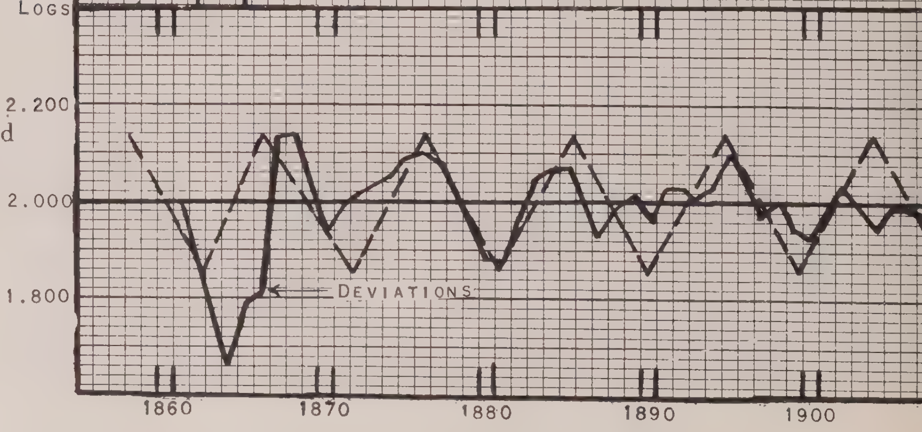


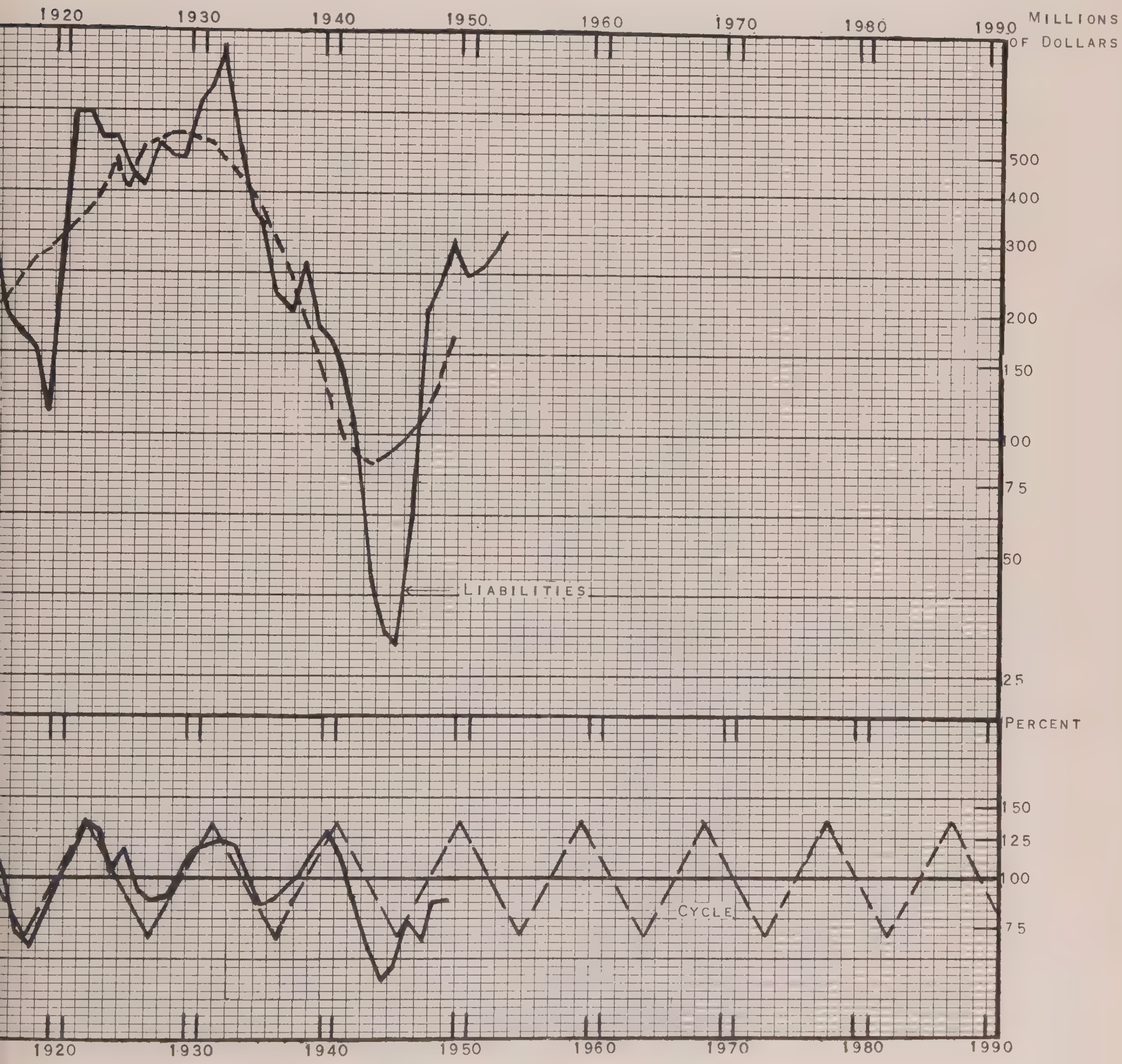
Fig. 5. Business Failures--The 9.2-Year Cycle. The Deviations of the 5-Year Moving Average from the 9-Year Moving Average and the Ideal 9.2-Year Cycle

cycles and express the smoothed data as percentages of the 9-year moving average trend (Fig. 4 and Fig. 5).

The 9.2-year cycle in commercial and industrial failures has a typical amplitude (height at crest or depth at trough) of 38% above trend at crest, 31% below trend at trough.

The crest of the typical cycle comes ideally at mid-1913; other crests of course comes ideally 9.2 years forward and backward from that time. This puts the latest trough of the ideal cycle in the fall of 1945. The latest crest of the ideal 9.2-year cycle came in the spring of 1950. The next crest comes ideally mid-1959.

A diagram of this cycle, projected to 1990, is shown as Curve D of Fig. 10.



The 3.4-Year Cycle in Failures

THERE is still another cycle in the liabilities of commercial and financial failures. It averages 3.42 years from crest to crest or trough to trough. It can be seen most clearly in the actual figures expressed as percentages from their 5-year moving average trend, as in Fig. 6 and Fig. 7.

This cycle was overwhelmed by the upsurge of failures of 1861 (Civil War) and the lack of failures in 1945 (World War II). It was also distorted from time to time by the 17 3/4 and 9.2-year cycles already mentioned and by a 5.9-year cycle

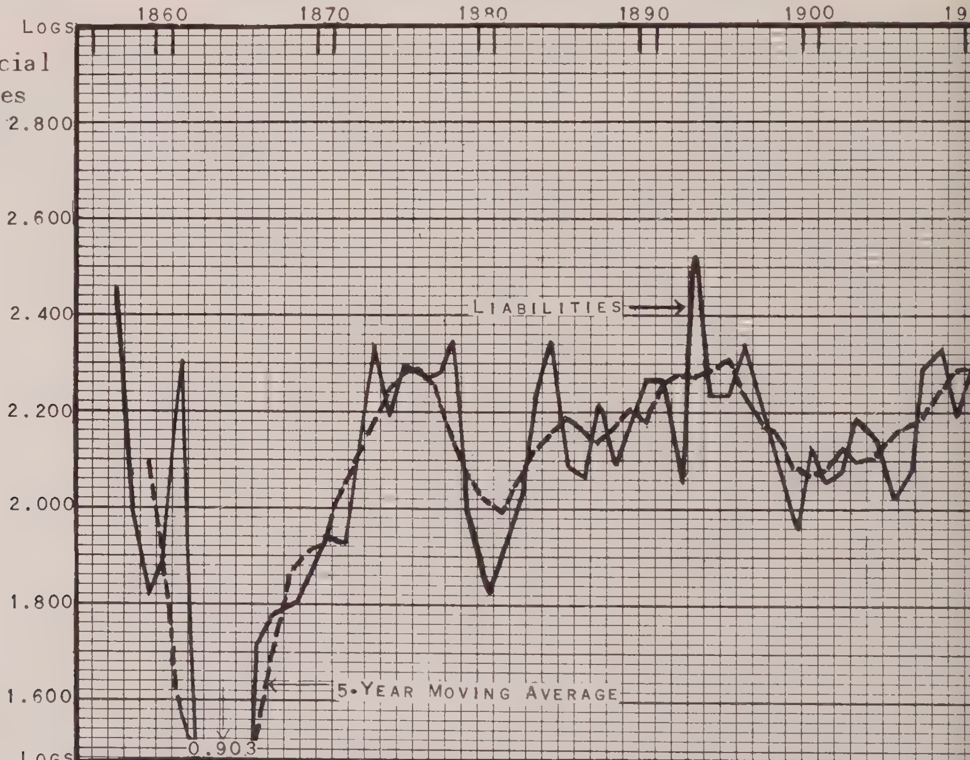


Fig. 6. Business Failures—Liabilities of Commercial and Industrial Failures and the 5-Year Moving Average of the Data.

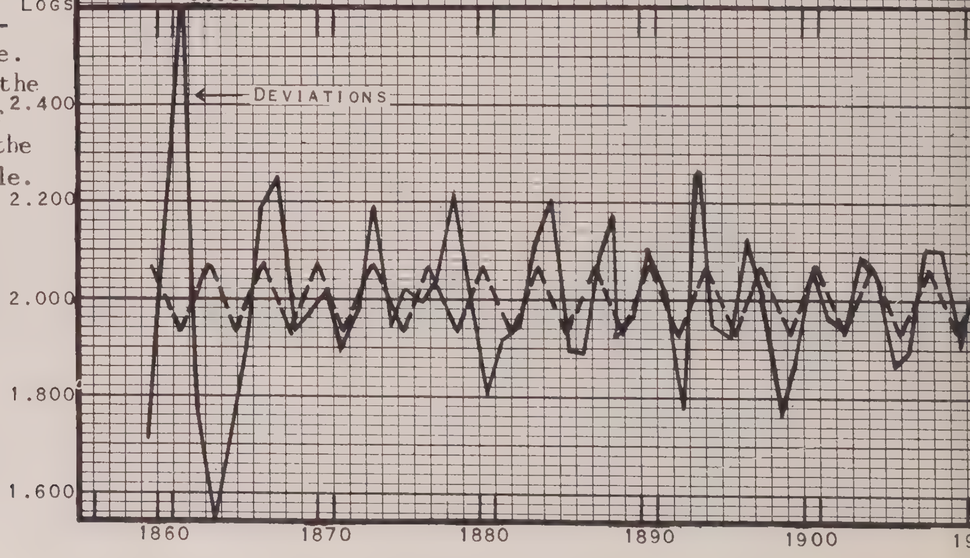


Fig. 7. Business Failures--The 3.42-Year Cycle. The Deviations of the Data from the 5-Year Moving Average and the Ideal 3.42-Year Cycle.

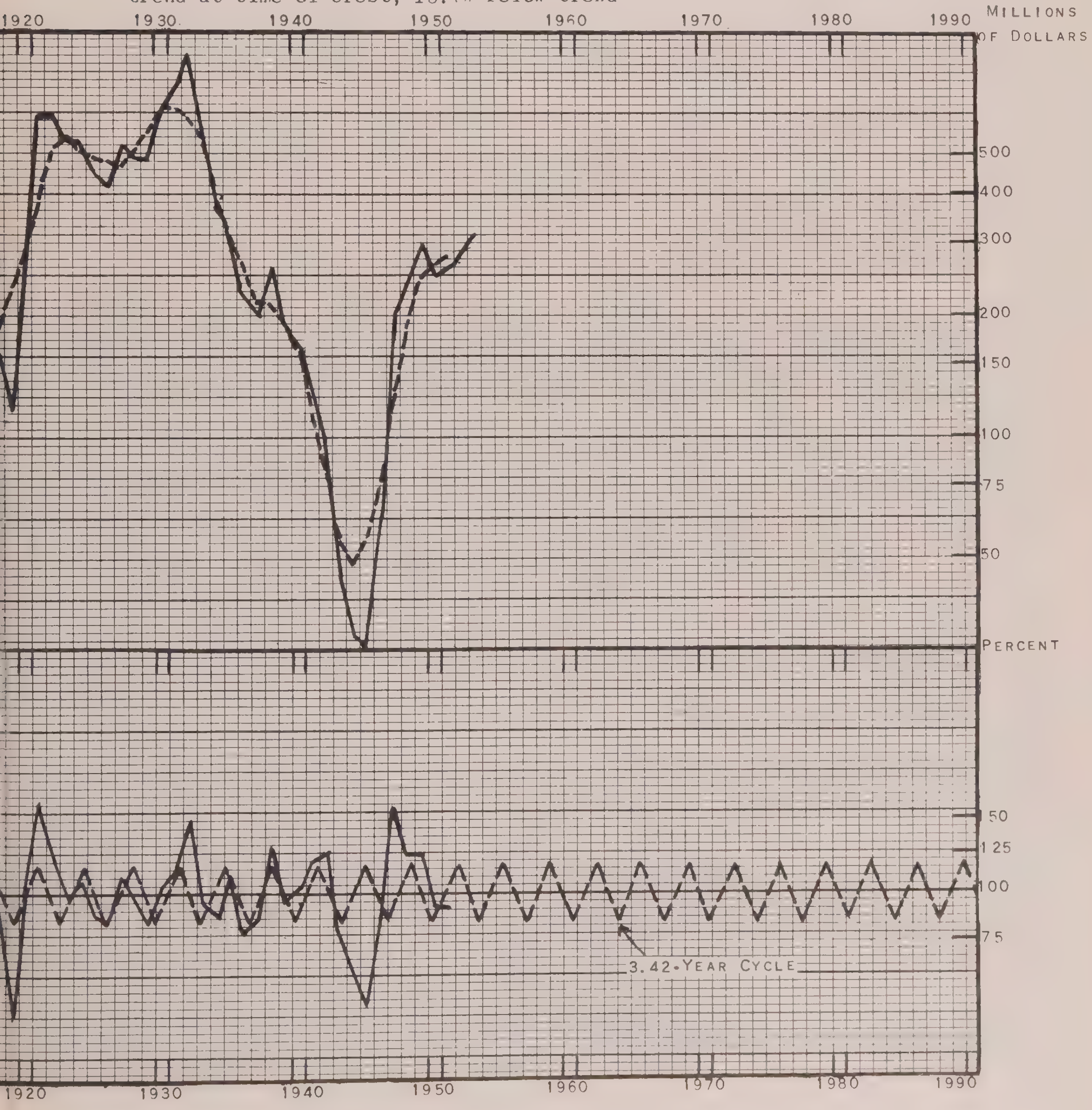
to be discussed in the next section. Nevertheless it governs the minor moves to a remarkable extent.

A cycle about 3.42 years (41 months) long has been discussed at length at various times in these pages.

The amplitude of the 3.42-year cycle in the liabilities of commercial and industrial failures is typically 15.8% above trend at time of crest, 13.7% below trend at time of trough. This figures out to a 34% rise from time of low to time of high.

Crests of the ideal 3.42-year cycle come ideally at the end of 1893 and 3.42 years forward and backward from that time.

This puts the last crest ideally at 1952.14 (February 1952), the next crest at 1955.56 (July 1955), the current low at 1953.85 (October 1953).



The 5.9-Year Cycle in Failures

THE next cycle in the liabilities of commercial and financial failures which I shall discuss in this issue of *Cycles* is one averaging 5.9 years from crest to crest.

This cycle is seemingly identical in length with the 5.91-year cycle in cotton prices and in sunspot numbers of which I spoke in my report of November 1951.

A full discussion of this cycle as it appeared in cotton prices, 1731-32 to 1947-48, is contained in Foundation report No. 2. A cycle of this length is also present, on the average, in pig iron prices, 1784-1951, in railroad stock prices, 1831-1950, and may be present, as a component, in the multitude of phenomena which show the so called 6-year cycle.

This cycle can be seen in the original figures, (Fig. 1), but more easily in the deviations of actual values from their 5-year moving average, after adjustment for the effect of the 3.42-year cycle and the 9.2-year cycle, as in Fig. 8.

The 5.9-year cycle in the liabilities of commercial and industrial failures has an amplitude of 12.5% above trend and 11.1% below trend.

The last crest of the ideal cycle came at 1949.8 (October 1949), the current low at 1952.75 (September 1952). The next crest will come at 1955.7 (end of August, 1955).

A diagram of the 5.9-year cycle is shown as Curve B of Fig. 10 on pages 266 and 267.

Fig. 8. Business Failures— The 5.9-Year Cycle. Deviations of Data from the 5-Year Moving Average Adjusted for the 3.42-, 9.2-, and 17 2/3-Year Cycles Together with the Ideal 5.9-Year Cycle.

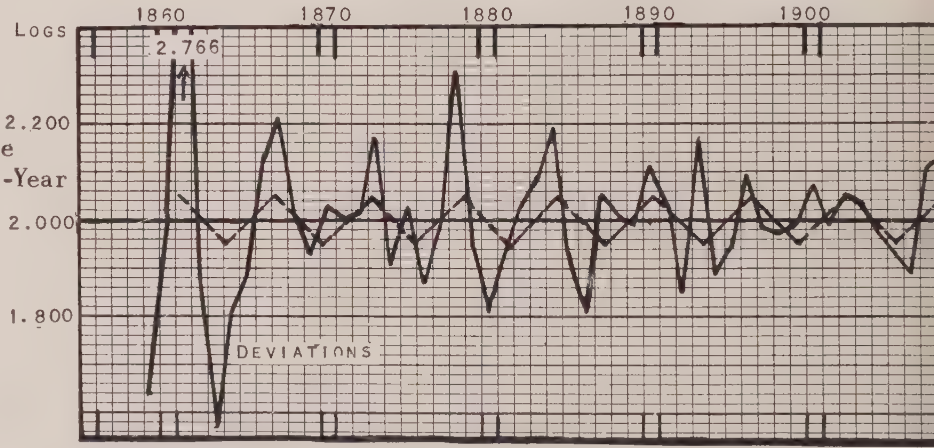
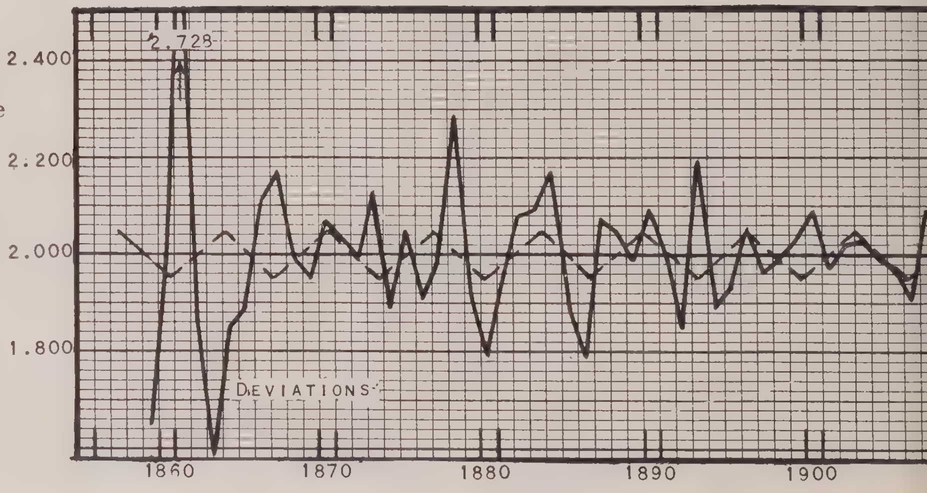


Fig. 9. Business Failures— The 6.5-Year Cycle. Deviations of Data from the 5-Year Moving Average Adjusted for the 3.42-, 9.2-, 17 2/3-, and the 5.9-Year Cycles Together with the Ideal 6.5-Year Cycle.



The 6.5-Year Cycle in Failures

THE last cycle in the liabilities of commercial and industrial failures to be discussed in this series of articles is one which is 6.5 years long, as nearly as I can measure it.

This cycle combines with the 5.9-year cycle to create a reversing 6.2-year cycle. That is to say, the combined effect of both cycles gives a 6.2-year wave which fades out then reappears upside down in relation to the original timing.

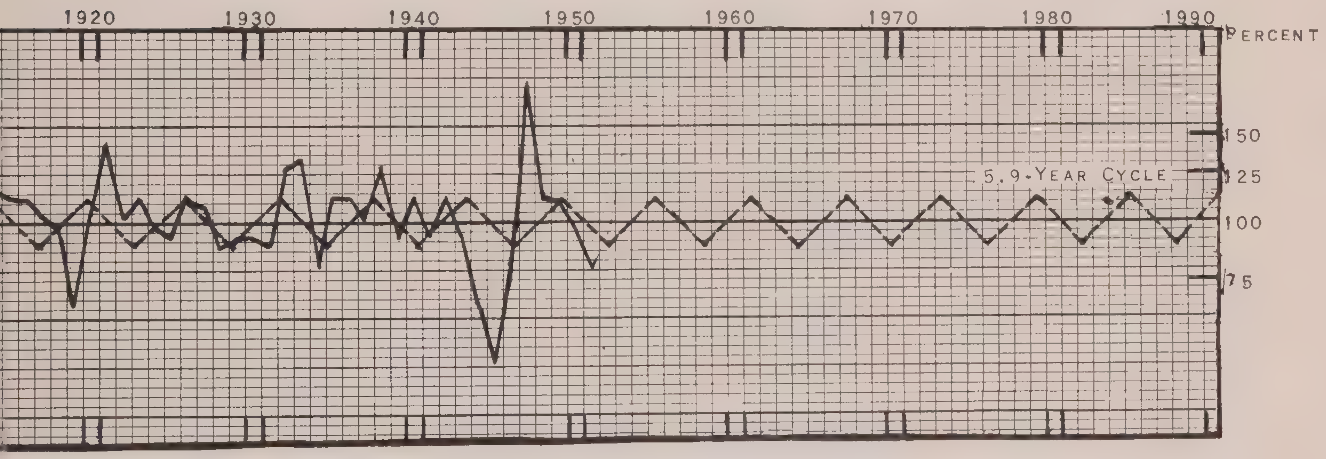
We can see this cycle most easily in Fig. 9 which is the same as Fig. 8, except that the 5.9-year cycle has been removed as well as the 3.42-, 9.2-, and 17 3/4-year cycles.

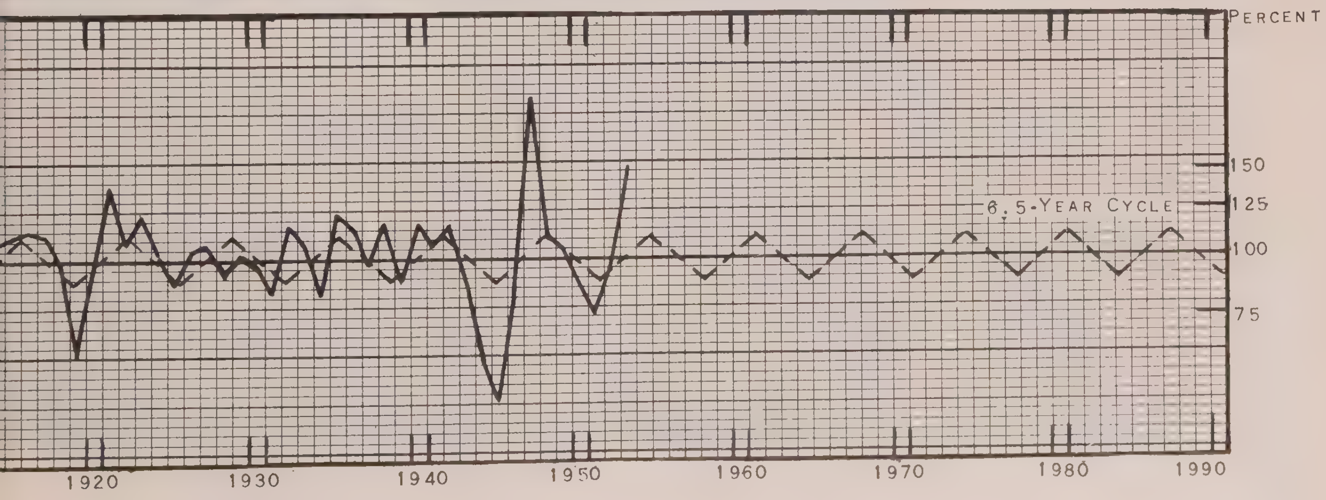
The 6.5-year cycle found in the liabilities of commercial and industrial failures may be the same as the 6.45-year cycle found in cotton prices from 1731 forward. The longer series of cotton price figures available probably gives a more accurate determination of its length.

The 6.5-year cycle in the liabilities of commercial and industrial failures has an amplitude of 14.3% above trend at time of crest and 12.5% below trend at time of trough.

The last crest of the ideal 6.5-year cycle came at 1948.5 (mid 1948). The last low was at 1951.75 (September-October 1951). The next crest is due 1955.0 (Beginning of 1955).

A diagram of the 6.5-year cycle is shown as Curve C of Fig. 10 on pages 266 and 267.





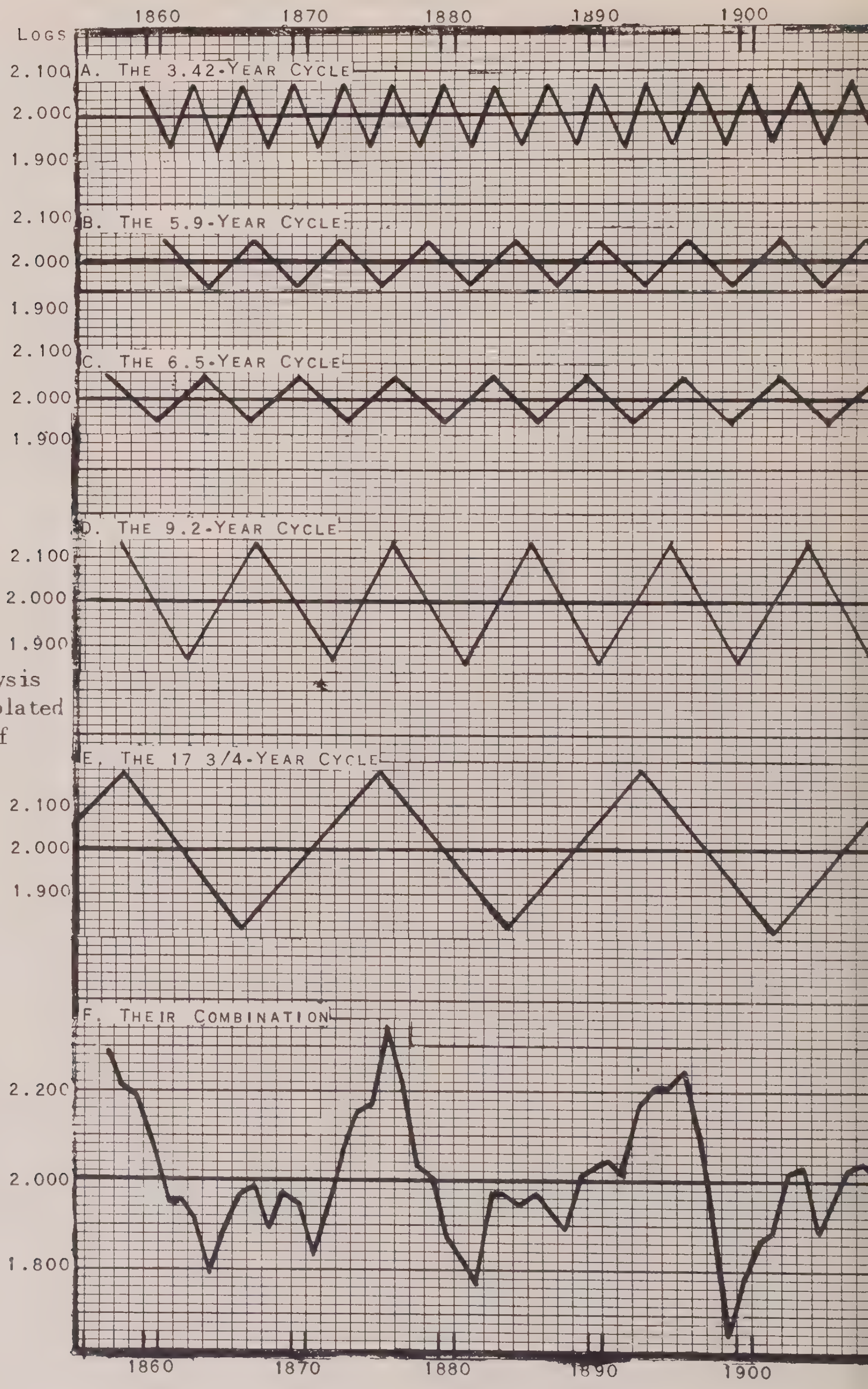
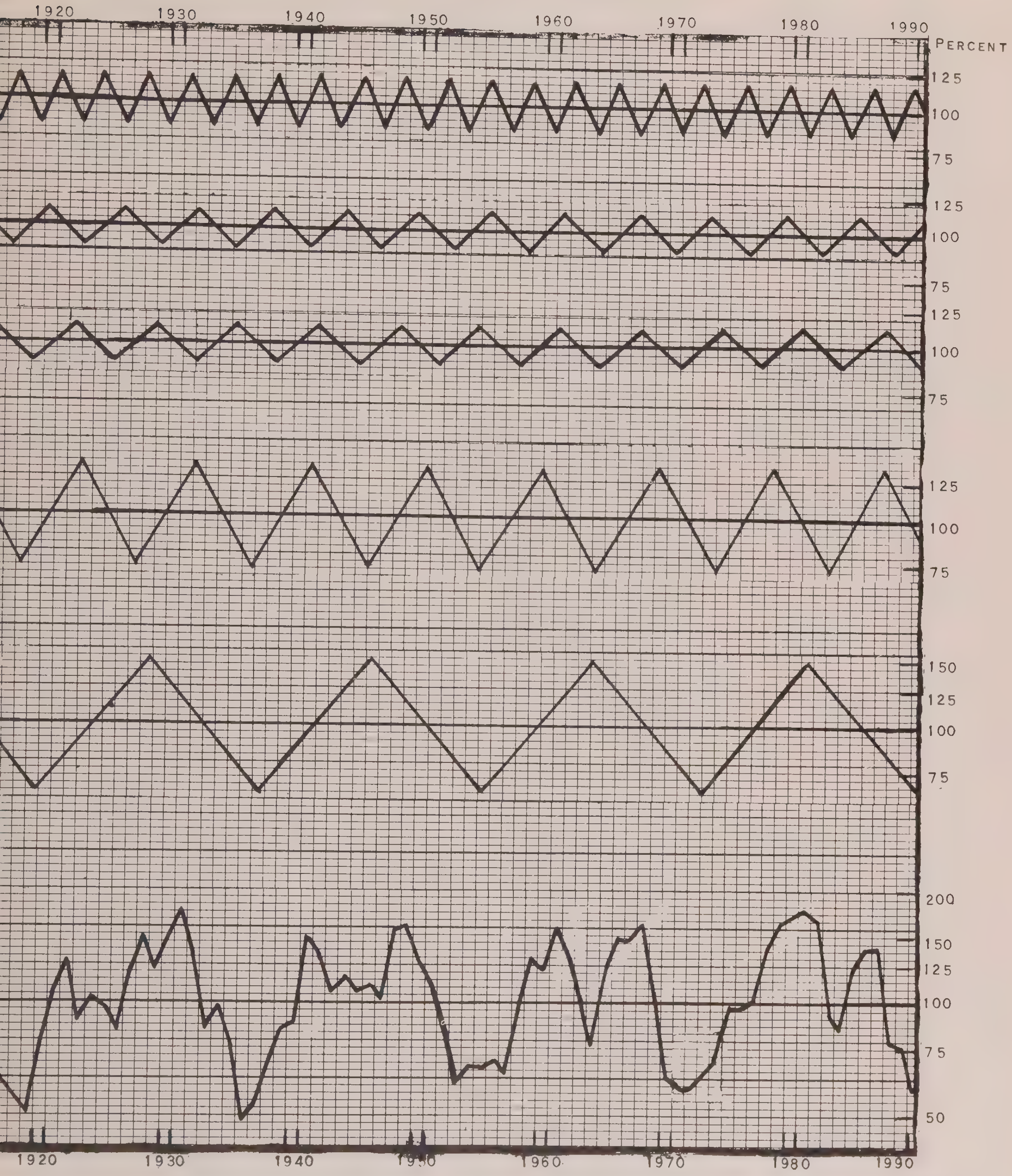


Fig. 10. Business Failures-- Summary of Cycle Analysis Showing All Cycles Isolated and the Combination of All Cycles.


1920
1930
1940
1950
1960
1970
1980
1990
PERCENT
125
100
75
125
100
75
125
100
75
125
100
75
150
125
100
75
200
150
125
100
75
50
1920
1930
1940
1950
1960
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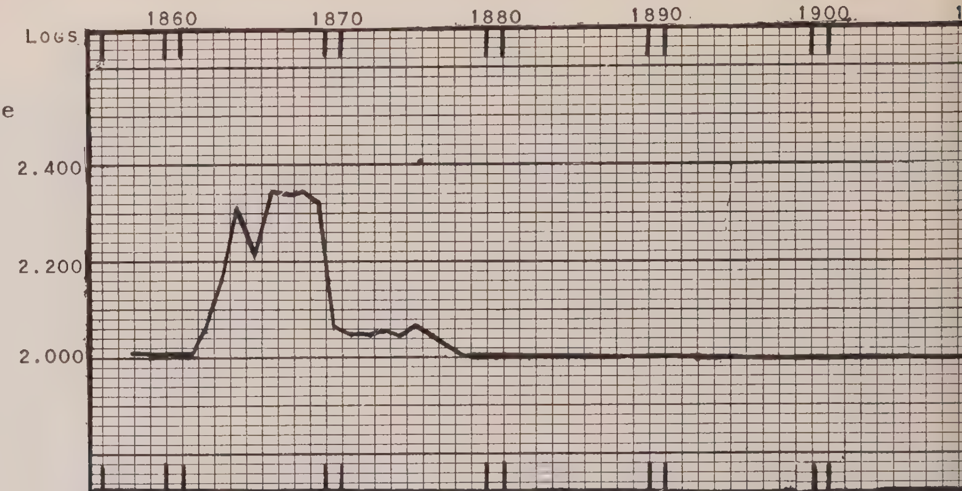
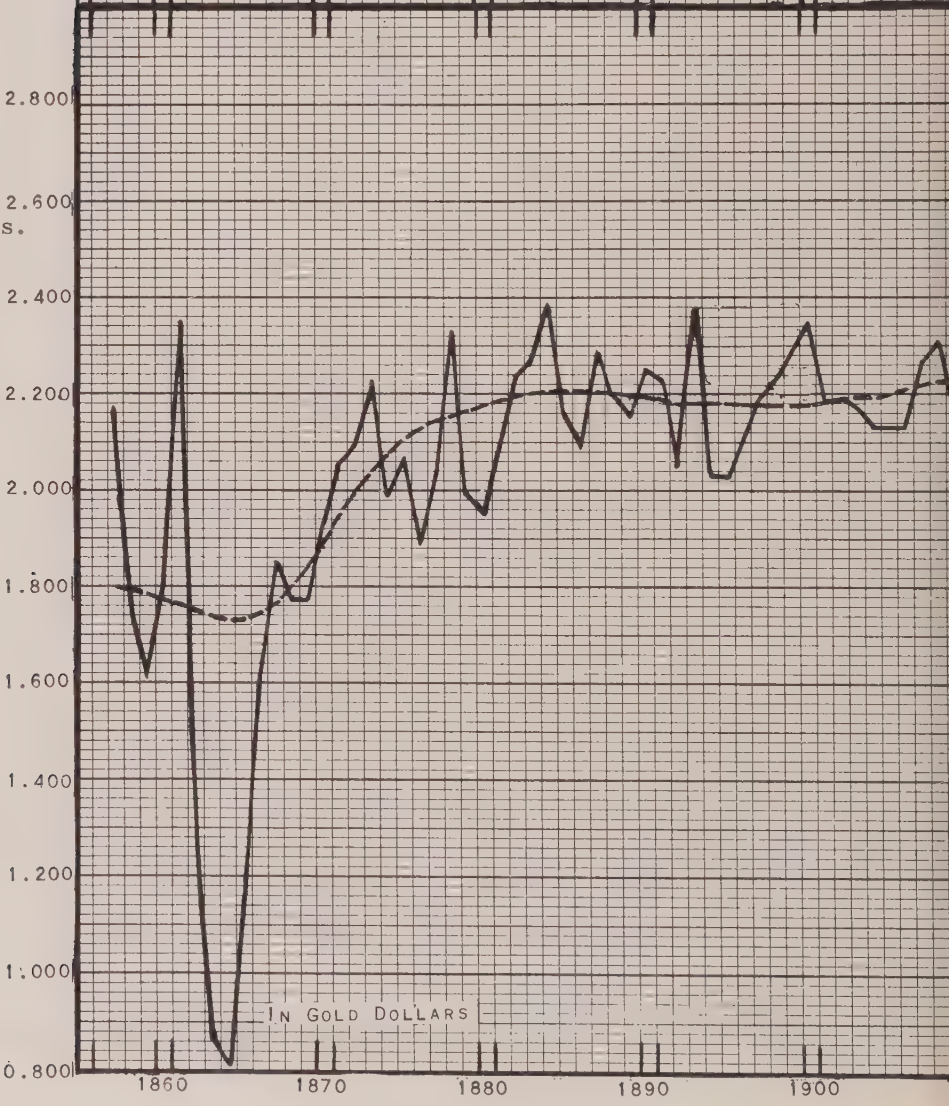
1980
1990

Fig. 11. Business Failures--
A. Inflation Factor—
The Index of the Price
of Gold.



B. Trend--Liabilities
of Commercial and
Industrial Failures
Excluding the 3.42-,
5.9-, 6.5-, 9.2-, and
17 3/4-Year Cycles,
Smoothed, and the
Trend. In Gold Dollars.



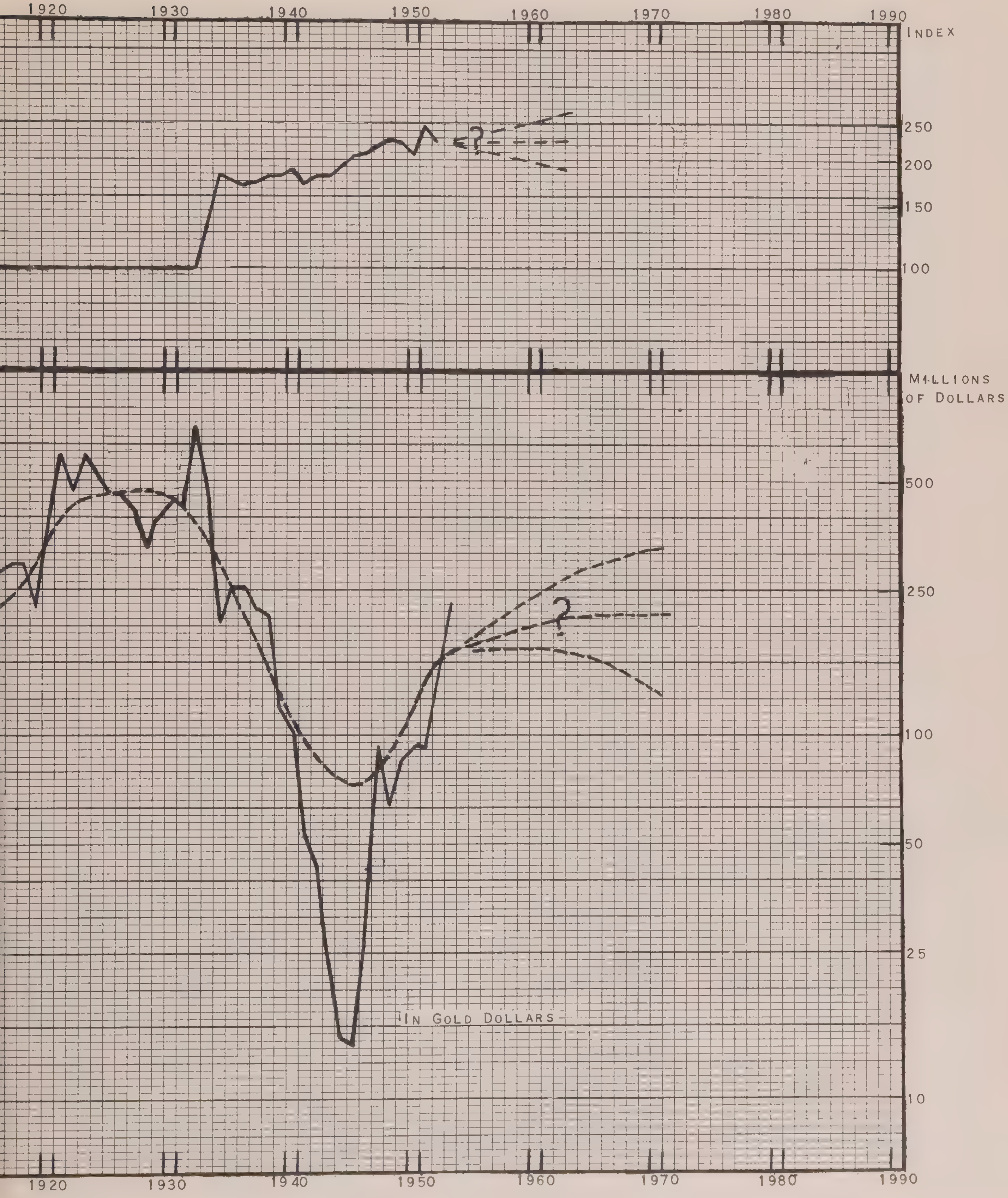

1920
1930
1940
1950
1960
1970
1980
1990
INDEX
250
200
150
100
?
MILLIONS OF DOLLARS
500
250
100
50
25
10
?
IN GOLD DOLLARS
1920
1930
1940
1950
1960
1970
1980
1990

Fig. 12. Business Failures—Actual and Forecast Liabilities of Commercial and Industrial Failures. The "Forecast" Line is the Combination of all the Cycles Isolated, the Trend, and the Inflation Factor.

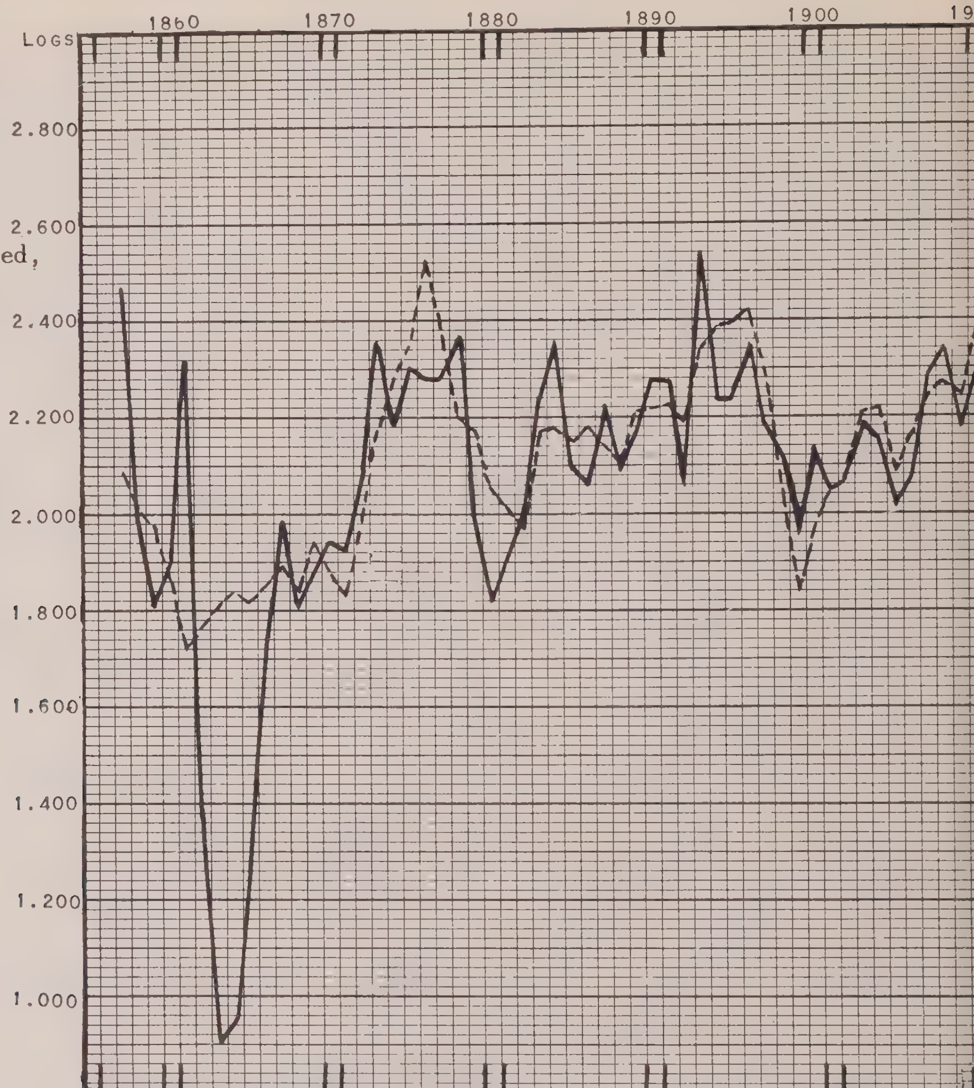
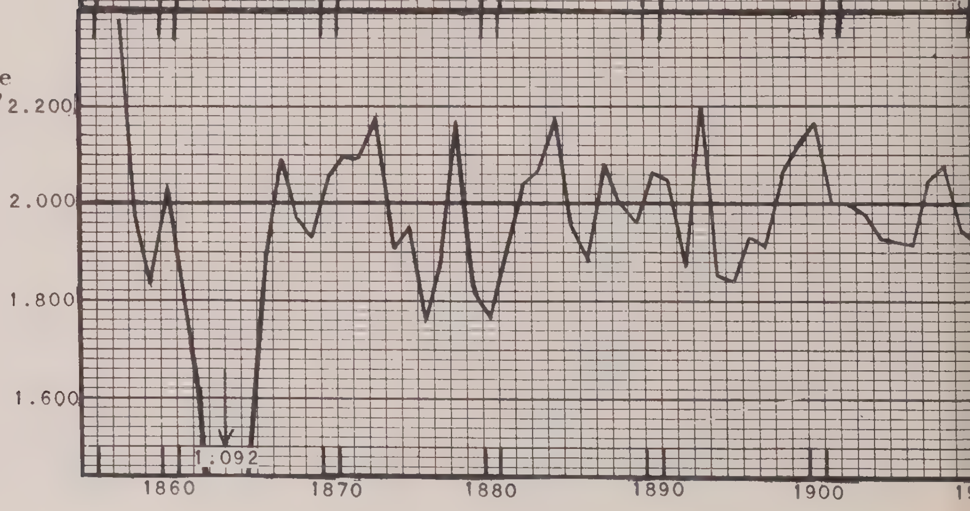
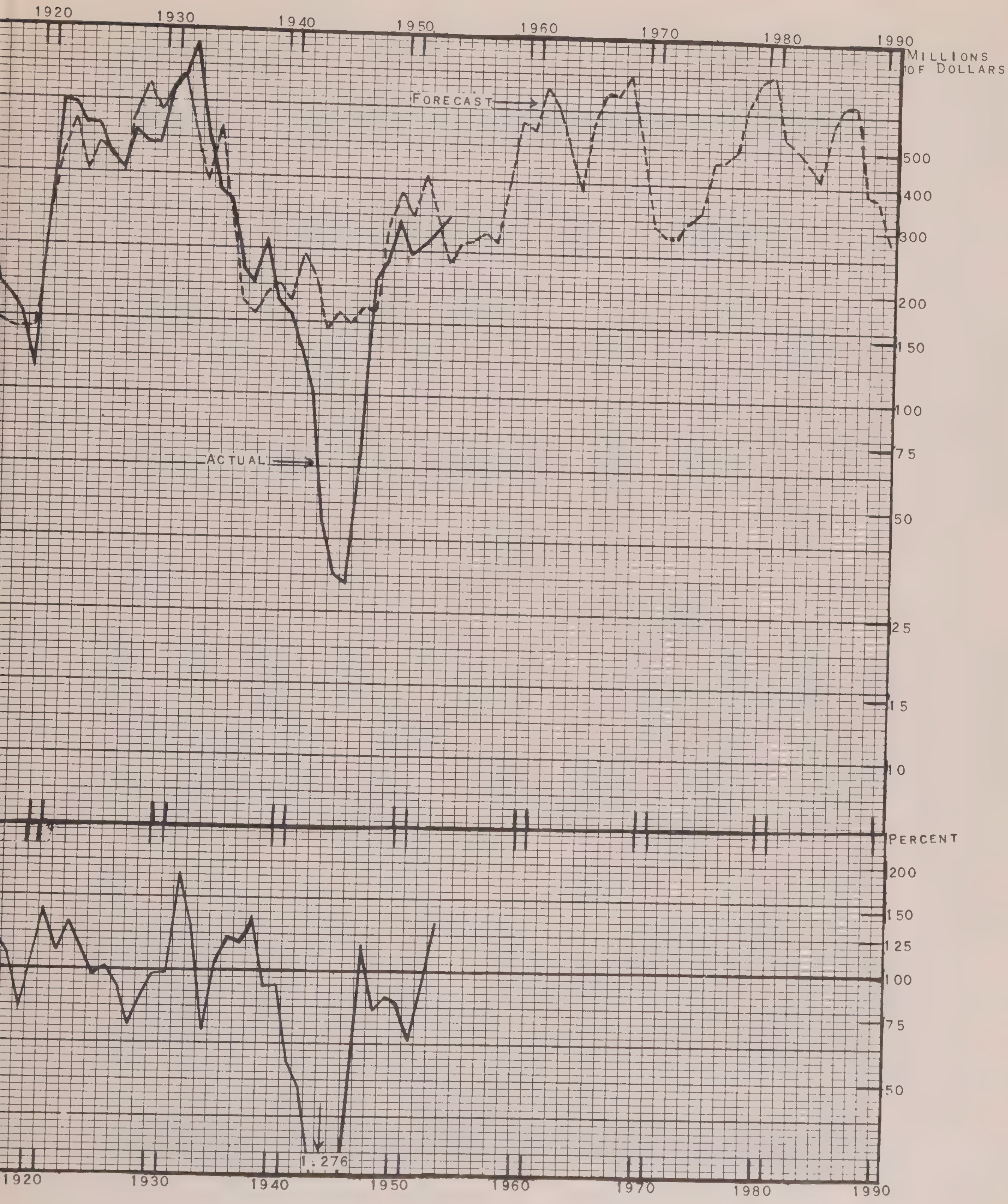


Fig. 13. Business Failures--The Residual. The Difference Between the Actual and "Forecast" Liabilities.




1920
1930
1940
1950
1960
1970
1980
1990
MILLIONS OF DOLLARS
FORECAST
ACTUAL
500
400
300
200
150
100
75
50
25
15
10
PERCENT
200
150
125
100
75
50
1.276
1920
1930
1940
1950
1960
1970
1980
1990

The Trend in Failures

THE trend of failures, like the trend of all phenomena, the data for which are expressed in dollars, divides into two parts. One part is the inflation factor. The other part is the trend itself, as expressed in dollars of gold.

For the period 1933 to date inflation is figured on the basis of the open market or black market price of double eagles in U. S. paper dollars. A table of such values will be given in the 1953 Postscript to Chapter VI of *Cycles*, to be printed in the November 1953 report.

A knowledge of cycles is of no help whatever in forecasting the future course of inflation. For help in this direction you should go to persons who have competence in this area. I am not such a person.

As for the trend proper, as distinct from inflation, a knowledge of cycles is of help because it enables you to know what this trend is, if the cycles are significant and have been correctly determined (see Fig. 11, Curve B).

What the trend will do from now on is, however, another area in which I have no competence. The most I can do is to call your attention to the fact that, by definition, *trend* is that element in a series of figures that changes its direction but slowly. Therefore, if you project trend into the future in more or less the same direction in which it has been going, and revise your projection each year as the actual figures unfold, you are not likely to be far wrong.

Forecast of Failures

THERE is one thing on which you can bet your last dollar, and that is that the forecast of the liabilities of commercial and industrial failures, as it unfolds from now to 1990. will *not* correspond precisely to the broken forecast line shown in Fig. 12.

First of all, in making this projection, I have had to assume that inflation will neither increase nor decrease, but it will.

Second, I have had to make a guess as to trend. This guess may be wide of the mark for more than a year or two in advance.

Third, the projection assumes no major wars in the next forty years—a most unlikely occurance.

Fourth, remember that the cycles which have been isolated *may* have been present in the data merely by accident, and *may* therefore not be significant.

Fifth, the synthesis or combination of the cycles, inflation factor, and trend have not always corresponded to actual behavior, even in the years gone by where we can know trend and inflation behavior. Compare the two curves in Fig. 12 to note the times when the two curves *failed* to agree. The divergence can be seen even more clearly in Fig. 13 which is the residual after adjusting for trend, inflation, and the five cycles. This residual represents cycles not yet isolated, errors, if any, in the determination of the five rhythmic cycles which were isolated, and random fluctuations.

Similar variations from the forecast line are *bound* to occur again.

Finally, bear in mind that I am attempting to project the *liabilities* of commercial and industrial failures and that these figures contain a large element of *price* as well as *depression*.

In spite of all these qualifications, the projection from 1953 to 1990, charted in Fig. 12, suggests that the liabilities of commercial and industrial failures may increase irregularly to a double top in the first and last part of the decade of the 1960's, after which we should have, in the 1970's, number of years with relatively low values for these figures. *E.R.D.*

How it Came Out

1944 STOCK PRICE FORECAST

EARLY in 1944, using figures through 1943, I made a reconnaissance survey of possible medium and long term cycles in the stock market. The work was done for a large brokerage firm in New York City.

The data used were annual averages of the Clement Burgess Index 1854-1870 spliced to the Combined Index of the Standard and Poor's Corporation Index 1871-1943. The cycles I isolated from the annual averages of these figures were 4-1/2 years in length and longer. I listed these cycles for you and gave you detailed information about them in my reports for March, June, and September 1951.

Having isolated these cycles in this preliminary sort of way I projected them into the future (to 1990) and combined them into a synthesis (see June 1951).

How has this projection worked out for the nine years since 1943? You will find the answer in Fig. 1.

Naturally I am quite pleased with the correspondence. It exceeded my wildest hopes.

Can this forecast be depended upon for the future? Definitely not. The work was too crude. I probably included some cycles which were present in the 1854-1943 figures merely by accident. I probably got some of the lengths slightly wrong. I probably missed important cycles also present. Then too there are always random non-cyclic factors to take into account. Sooner or later the forecast will surely fail. Note too that it has no short cycles.

Significance

It is hard to believe that the marked correspondence between these two curves could have come about by accident. Granted that the forecast contains a large element of beginner's luck, it cannot reasonably be *all* luck. In our cycle work we would seem to be definitely on the right track. Long range stock market forecasts that come true *can* be made. Ups and downs of the market *do* seem to register the combined effort of predictable rhythmic forces.

E.R.D.

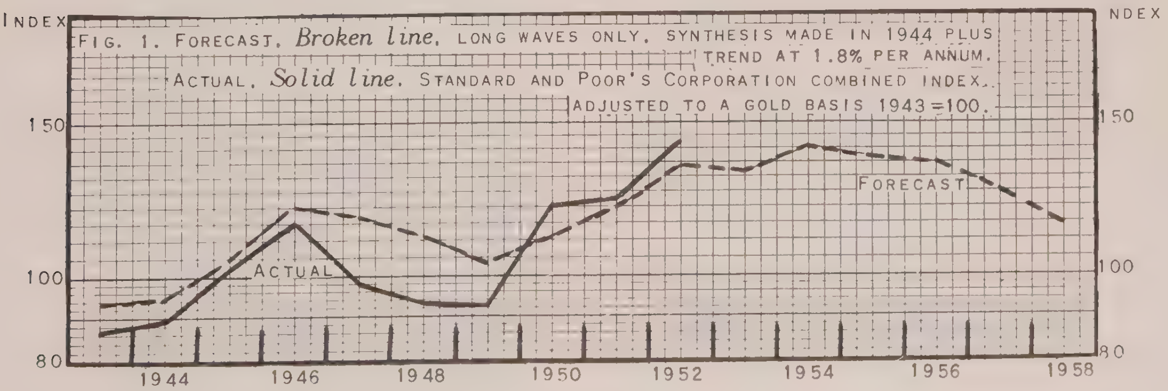


FIG. 1. FORECAST. *Broken line.* LONG WAVES ONLY. SYNTHESIS MADE IN 1944 PLUS TREND AT 1.8% PER ANNUM. ACTUAL. *Solid line.* STANDARD AND POOR'S CORPORATION COMBINED INDEX. ADJUSTED TO A GOLD BASIS 1943 = 100.

Foundation Affairs

OUR MEMBERSHIP PROGRAM

ON January 1, 1953, we had 1,308 members. On August 1, seven months later, we had 2,889 members. This is an increase of 1,581 or 121%.

It may interest you to know how this increase was brought about, and what it means to the Foundation.

Two hundred thirty-eight of the new members came from display advertising which we inserted in various financial publications. Thirteen hundred forty-three new members came from direct mail advertising sent to various important people throughout the country.

We find that it costs $8.41 to obtain a new member by advertising, $7.94 to obtain one by direct mail. Direct mail costs less, and we feel it is better because the people who come in have a better idea of what the Foundation is all about and are more likely to stay with us.

Including overhead, our direct mail advertising costs us $103 a thousand letters. Our response is about 1.3%, which is considered very good for a $10 offer. A 1.3% response means 13 new members, or $130 for every 1,000 letters mailed. This rate of return gives us a gross of about $2 to apply to publication office expense and membership material and service costs. These amount to about $3.50 per member per year. We thus lose about $1.50 the first year on each new member, to say nothing of his share of the cost of the research which goes into the reports.

I do not know how many of our new members will renew. Magazine publishers tell me that 55% is generally considered to be pretty good. Eighty-five per cent of our old members renew, but it is too much to hope that the new members will renew at this rate.

At the rate we are growing we should have 5,000 members by April 1, 1954. If our renewal rate is as predicted we will gross $27,500 for the fiscal year starting at that time.

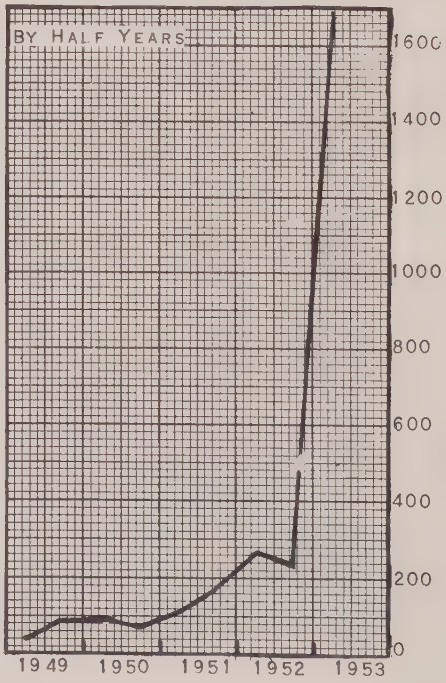
This sum of money should be just about enough to pay all the operating expenses of the Foundation, except a salary to me.

The only fly in the ointment is the fact that in times of receding business and falling stock market prices the response to our letters is not likely to be as favorable, and our renewal rate is not likely to be as high. This fact may interfere with the fulfillment of our hope to get our membership plan out of the red.

Our new members may not know that we have no endowment, that up to now the loss on our membership program has been pretty much made up by profit on research done for various large corporations, and that I make up the rest of the deficit out of my own pocket. As my pocket is not very deep, I am hoping that plans for self sufficiency work out as scheduled.

E.R.D.

NEW LAY MEMBERS



Letters

A Letter from Claude A. Grant

Dear Mr. Dewey:

I am interested in real estate, building activity and related subjects; and feel a need for more and better information. I would deeply appreciate any suggestions you might make regarding monthly or weekly publications or reports, which cover real estate cycles, including current data and, if possible, forecasts.

The "Real Estate Analyst", which you often refer to, is not available through regular magazine dealers or distributors in this area. How can I obtain it?

I wonder if any work is being done with the Pareto Index or any similar approach? Since the economy seems to have recently passed a major turning point, I feel that these figures might prove interesting.

Please accept my congratulations for the excellent work you are doing in the foundation. I find the Monthly Report valuable, stimulating and very interesting.

Very truly yours,
Claude A. Grant

Oxnard, California

In Reply I Said:

Dear Mr. Grant:

Thanks for your kind words about the monthly report.

The "Real Estate Analyst" is published by Roy Wenzlick of St. Louis. Mr. Wenzlick would doubtless send you a sample copy of this publication and quote you prices. I do not know whether or not Mr. Wenzlick's publications include forecasts but I am sure he would be glad to tell you.

The most information for the least money in regard to what *is* happening comes in the Survey of Current Business, published by the Department of Commerce in Washington, D.C. for $3.25. Single copies are 30¢. Why not send 30¢ to the Department of Commerce Field Office at 112 West 9th Street, Los Angles 15, California, for a sample copy. This publication brings up to date, each month, nearly a hundred different construction and real estate series in addition to hundreds and hundreds of other series.

The annual subscription to the Survey of Current Business includes a weekly supplement, but none of the weekly figures pertain to real estate or construction.

I plan several articles in regard to real estate and construction during the autumn.

I do not know of any work being done at the present time with the Pareto Index. I agree with you that the computation of this index would be most interesting.

Ever cordially yours,

A Letter from Robert G. Holt

Dear Mr. Dewey:

It occurs to me, after studying your charts that if you could forecast fire losses, you might be able to get Fire Insurance Company subscribers that would make substantial payments for such service.

In fact, if it were 75% good, the insurance companies would get rich and we might be tempted to buy fire insurance company stocks.

We can do nothing, try as we will, about fire losses; but an Insurance Company could reduce its insurance commitments on an ascending loss record by taking smaller amounts of insurance on property, or increase its reinsurance and accomplish in part the same result and get "picky" in the class of business accepted. All, however, to be done so as not to damage too much the needs of the Company's Agents to handle their business.

On a descending scale of fire losses, the Insurance Company could reverse the above procedure and go all out for more business which presumably would show an increasing underwriting profit. There are other angles, of course, to insurance underwriting but the essence is as I have outlined it, an effort to do those two things, up and down.

Fire Insurance is tradition bound and one would have to hunt a Company or Companies at least willing to listen to the cycle theory. If you think you have something I'd be glad to sound out the Management of some of the Companies I represent as Agent, and be interested in watching the play if someone tries the theory.

Yours very truly,
Robert G. Holt
Providence, Rhode Island

In Reply I Said:

Dear Mr. Holt:

If you can get hold of a long series of fire loss figures I shall be glad to take a look at them.

On two occasions in your letter you speak of cycle "theory." This term is a bit of a misnomer. It implies that we who study cycles have a theory that repetitive patterns will continue. Those of us who know a little something about the subject do not hold this theory. We merely advance the truism that repetitive patterns *may* continue and that the more times a pattern has repeated in the past and the greater its dominance, the better the chances are that it has an underlying cyclic cause and therefore the better the chances are that it will continue. This is in no sense a theory but a statement of obvious statistical probability.

I look forward to seeing the loss figures or loss ratio figures after which we can see if it would be worthwhile to try to stir up one of the companies.

Cordially yours,

A Letter from Henry S. Cushman

Dear Mr. Dewey:

Thanks for your note and I am glad to be a subscriber once more.

I gather there is not now much doubt that the 9.2 year cycle in stocks came early—came in June 1949. This trough was really due in April 1951, I understand. Where a trough, for instance, comes early like this one, does the next crest generally come about 4.6 years after or does it correct itself and come 4.6 years after the former 'ideal' trough? In 1955?

I sent for the latest Predix chart on the Dow Industrials and outside of a rather small Sept.—Oct. rally, the forecast seems for tremendously lower prices in the next year or two. In fact, the average seems to drop under the June 1949 low of 160.

In connection with the above, how would the 9.2 year cycle fit in?

Thanking you a great deal in advance, I am,

Sincerely,
Henry S. Cushman
Saranac Lake, New York

In Reply I Said:

Dear Mr. Cushman:

I was very glad to get your letter of July 21. The combined effect of a number of short cycles can easily overwhelm a long cycle. This fact is illustrated by the projection of stock market prices to 1990 which was sent to you with your new subscription. This projection includes the 9.2-year cycle and shows how the other cycles, in combination, advanced the low from 1951 to 1949.

If the 9.2-year cycle is real and continues—and I firmly believe it is real and will continue--it is operating according to schedule all the time. It is merely that the *effect* of it is overwhelmed by other cycles or accidental forces. The crest of the 9.2-year cyclic *force* would come 4.6 years after the *ideal* time of low. But the crest of the *market* might come before or after that time, depending upon the forces of the other cycles, and randoms.

The forecast to 1990 suggests that the crest of the current move will come in 1954, but you must remember that this was a preliminary job and that it does not include any cycle shorter than 4 1/2 years. The presence of the shorter cycles could easily advance or delay the crest of the current move by a considerable amount.

Ever cordially yours,

Questions & Answers

Question: Why is it that forecasts based on cycles are sometimes wrong?

Answer: **1.** The first reason cycle forecasts are sometimes wrong is that cycles are only part of the answer.

Cycles constitute only one of three elements, and sometimes four, which enter into the behavior of things. In addition to cycles you have (a) growth, (b) random fluctuations, and, with anything measured in dollars, (c) inflation. To get a correct forecast of anything these other factors must be determined correctly, too.

2. A second reason for the failure of cycle forecasts is to be found in the fact that the cycles as determined may not continue for any one of several reasons as follows:

(a) The cycle may have been present in the figures you have studied merely as a result of accidental or random forces. Such cycles will not continue.

The only way I know of to tell whether a cycle is or is not the result of random forces is to be sure that the cycle has repeated itself *enough* times with *enough* regularity and *enough* dominance so that it cannot reasonably be the result of chance.

(b) A cycle may be the result of real cyclic forces and still may not continue. For instance, if you observe a 9.3-year cycle which is caused by the combined effect of 9.1 and 9.5-year cyclic forces, the observed 9.3-year cycle will ultimately fade out as the two causative cycles get more and more out of step with each other.

(c) You may not have determined the cycle length correctly. This is what happened to Benner's cycle forecast of pig iron prices made in 1873. It worked with gain-loss ratio of 31 to 1 over a period of nearly 70 years but it can no longer be relied upon because the cycle lengths, as originally determined, were slightly in error and are now out of step with actual pig iron prices.

Question: What do you plan to call your new book?

Answer: *How to Make a Cycle Analysis.*

Question: Would you hazard a guess about the overall accuracy of cycles as a forecasting technique?

Answer: Our knowledge of cycles is in a rudimentary stage and present cycle work is crude, but my observation is that cycle forecasts are more accurate than any other forecasts I know.

Question: When a person is not going into business, what use are cycles to him?

Answer: They may not be of any use directly. Indirectly, however, they are vital in several areas of life.

There is hardly any person who lives so independently that he is not affected by wars, by disease, by business depressions, and by the weather.

Wars have tended to come at such regular time intervals that there is reason to believe that some cyclic force is at least partially responsible for their coming. If we wish to eliminate or even to minimize their causes. This includes knowing about the cyclic forces which, seemingly, are one of the causes of war.

I admit it is a long process; first to discover all the cycles in war; second knowing the cycles, to know their causes; third knowing the causes, to know how to offset them; and fourth, to do so.

All of this will probably do you no good personally, but it may save the life of your great-great-grandson.

In regard to weather we hope merely to be able to forecast the weather for long periods in advance, to the great benefit of farmers and others and of course, indirectly, to the benefit of consumers such as you and I.

Additions to the Library

"Diurnal Potentials in the Maple Tree," by H. S. Burr, reprinted from **Yale Journal of Biology & Medicine**, 1945, Vol. 17, pp. 727-734, 8 pages, 4 figures, references. Gift of the author.

Dr. Burr, Professor of Anatomy at the Yale University School of Medicine, finds daily cycles and lunar cycles in the electric potential of various trees.

As he himself puts it: "The evidence presented here makes it quite plain that in a growing tree there are diurnal variations in the living process which possess electric correlates. The 24-hour rise and fall in potential seems, in general, to be characteristic of the month of the year as well as the season of the year. The standard pattern, moreover, would seem to be significantly different during the period of the new moon than during the full moon. While undeniably endogenous factors must play a major role in the daily variations, the evidence so far collected points to the very real possibility that external factors also are involved. So far, a search for correlations with changes in barometric pressure, temperature, and humidity has failed to show any significant relationship. Of all the external factors examined, the phase of the moon seems to be the only one showing any degree of correlation. This, of course, does not mean necessarily that the moon itself is altering the magnitude of the potential difference. It is quite possible that they are both secondary phenomena, activated by some more basic factor in the universe. Nevertheless, it must not be forgotten that the rise and fall of the tide are believed to be directly attributable to the lunar cycle. It is, therefore, not at all impossible that the lunar cycle produces, in some as yet undiscovered way, tides in the tree. Moreover, since the standing potential in both plants and animals seems to bear a significant relationship to growth and developments, and since growth in trees is in part a matter of hydration, it may eventually turn out that the effect of the lunar cycle on the growth of the tree is as direct as on the tide level."

• • •

"Science and Mankind," by Flinders Petrie, **Nature**, Vol. 142, Oct. 1, 1938. Gift of Frederick W. Simonds.

Sir Flinders Petrie, the noted British archeologist, was a firm believer in cycles in civilizations. His book, **The Revolutions of Civilization**, published in 1911, (and republished for you as Foundation Reprint No. 36) antedated Oswald Spengler's **Decline of the West** and A. J. Toynbee's **Study of History** by many years.

The short article cited above adds additional facts regarding repetitive historical patterns. It is of enough general intrest so that we will reprint it entire as soon as space is available.

• • •

"Dendrometer Studies of Five Species of Broadleaf Trees in Indiana," by Ray C. Friesner. Reprinted from **Butler University Botanical Studies**, Vol. 5, 1942; pp. 160-172, 13 pages, 3 tables, references. Gift of the author.

Dr. Friesner, who is Dean of the College of Liberal Arts and Sciences, Butler University, shows that there was (in the summer of 1941) a daily reversible cycle in the diameter of an American Elm studied. The diameter was greatest in the early forenoon and least in the late afternoon. No other cycles were noted.

EXCERPTS FROM

CYCLES

THE SCIENCE OF PREDICTION

CHAPTER V

by EDWARD R. DEWEY
Director, Foundation for the Study of Cycles

and EDWIN F. DAKIN
Associate, Foundation for the Study of Cycles

TOGETHER WITH 1953 SUPPLEMENT

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V

Some Rhythmic Cycles in Natural Phenomena

CYCLE, as a word from the Greek meaning circle, implies a coming around to the place of beginning. It is used by most people in a very general sense, and we shall employ it here in that same general way. Two other words which hold more exact meaning are " rhythm " and " periodicity."

Cycle does not necessarily imply any regularity in time intervals. Thus one business cycle, as measured from the trough of one depression to the trough of the next, could be four years in length, and the next seven years, and the next thirteen. And one cycle of growth in a human population, as measured from one period of basic stability to another, might be 100 years or a thousand.

Rhythm, or *rhythmic cycle,* will ordinarily be used to denote a cycle which repeats itself at rather uniform time intervals. Rhythm implies a kind of beat. Thus the beating of the heart is rhythmic, though it may be slightly irregular.

Periodicity, periodic cycle, or *regular cycle,* will be used to denote a cycle which repeats itself at mathematically exact intervals. True periodicity, like a true straight line or a true circle, does not exist in nature; but we have close approximations.

The idea that cycles in human affairs may be rhythmic or periodic has stimulated research for many years.*

Today hundreds of scientists are engaged in some phase of research in the study of cycles. To the man in the street some of their research may seem spent on trivial subjects. Cycles in the incidence of field mice, tent caterpillars, and lynx may appear a far cry from the question of whether or not there are rhythmic cycles in steel production and commodity prices. But just as great advances in medicine, psychology, and other sciences have resulted from the study of lower forms of life, so recent progress in studying rhythms in human affairs owes much to knowledge gained in other fields. Not only is human life complex; it is also evidently subject to a whole complex series of rhythms, as we shall see. And these various rhythms supplement and interfere with each other so that they are often extremely difficult to isolate and trace.

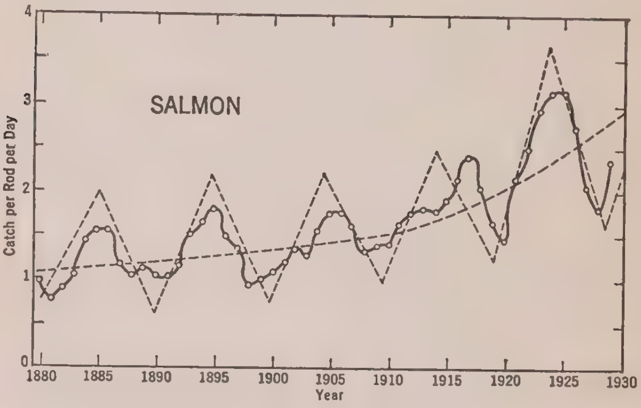

FIG. 1. ABUNDANCE OF ATLANTIC SALMON

Catch per rod per day on the Restigouche River, Canada, 1880–1929, smoothed by a three-year moving average (after Phelps and Belding), together with a regular 9⅔-year cycle. (Appendix II tells about moving averages.)

In the various lower forms of life, which are evidently subject to simpler laws, it is usually possible to find rhythms more clearly revealed than in human affairs. Note, for instance, Fig. 1, which shows the abundance of salmon on the Restigouche River in eastern Canada, from 1880 to 1929. This study was made by Professor Earl B. Phelps of Columbia University, in co-operation with Professor David L. Belding of the Boston University School of Medicine. The statistics were available because an exclusive fishing club along the river had for years insisted on full records regarding the number of fish caught by its members, and the time spent in fishing. The catch of fish per rod per day shows five clear maxima between 1880 and 1930. When a trend and a periodicity of 9⅔ years are added to the chart, it is interesting to note that—even though at some points the rhythms are distorted—they later snap back into the pattern.

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* The list of those to whom the modern student of business cycles must be indebted is long. T. C. L. de Sismondi was among the first pioneers, with his *Nouveaux Principes d'Economic Politique* (1819). Clément Juglar published his *Des Crises Commerciales et de leur retour périodique* in 1860. A. A. Cournot, publishing his *Recherches sur les principes mathématiques de la théorie des richesses* in 1838, is credited with inspiring Jevons, Léon Walrus (1834–1910), F. Y. Edgeworth (1845–1926), V. Pareto (1848–1923), and A. Marshall (1842–1924). W. S. Jevons, who published *On the Study of Periodic Commercial Fluctuations* in 1862, has been called the father of index numbers. Sir Francis Galton (1822–1911) invented correlation analysis, and Karl Pearson (1857–1936) developed it as a tool for statistical analysts. J. H. Poynting in 1884 and R. H. Hooker in 1901 contributed to work on the problem of the secular trend. H. L. Moore in 1914 developed harmonic analysis and correlations in his *Economic Cycles: Their Law and Cause.* Warren M. Persons, who made the first of his business barometers in 1915, began his work on business cycles at Harvard in 1917. Joseph A. Schumpeter, Professor of Economics at Harvard, created a monument with his publication in 1939 of *Business Cycles: A Theoretical, Historical and Statistical Analysis of the Capitalist Process.* The work of George F. Warren and Frank A. Pearson of Cornell is well known. Harold T. Davis, in *The Analysis of Economic Time Series,* published as Monograph No. 6 by the Cowles Commission for Research in Economics, has made an important contribution. Irving Fisher's *The Making of Index Numbers,* published in 1922, was a landmark. N. D. Kondratieff, who published *The Long Waves in Economic Life* in 1926, has thrown much light on the 54-year cycle. Wesley C. Mitchell, who published *Business Cycles, The Problem and its Setting* in 1935, is one to whom every subsequent worker in the field must be indebted. A. F. Burns, in his *Production Curves in the United States since 1870,* is required reading. Such a brief listing can only skirt the fringe of those to whom the authors of this book are deeply obligated. Still others are mentioned in footnotes elsewhere.

A rhythm of around 9⅔ years has likewise been found in the lives of lynx. Note the graph in Fig. 2. Many years ago, when great fluctuations in the annual catch of pelts by the Indians troubled the Hudson's Bay Company, an inquisitive worker in the organization started to plot the annual catch. Since the trappers would work at least as hard in bad years as in times when the catch was good—and probably harder, for a good catch always meant plenty of money for firewater—the plotting may be considered a fair record of the number of animals at large. It apparently varied greatly. The chart shows fluctuations in offerings from as low as 4,000 skins in a poor year to over 70,000 in a really good one. The plotting reveals a distinct 9⅔-year rhythm.

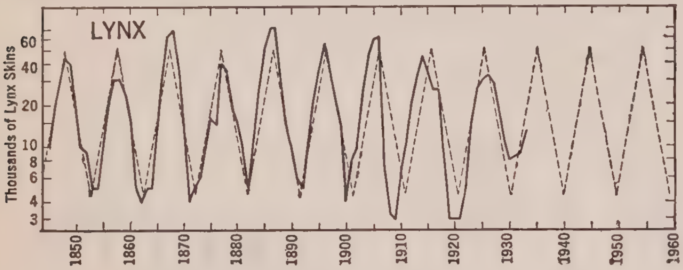

Fig. 2. Abundance of Lynx

Offerings of skins to the Hudson's Bay Company, 1844–1933, together with a regular 9⅔-year cycle. *Ratio scale.* Similar behavior is evidenced back to 1735. (Data from Hewett and Hamilton.)

A similar 9–10 year rhythm has been found by other investigators in the abundance of grouse. Curiously enough, it has also been found in the abundance of tent caterpillars. Figure 3 charts the number of letters dispatched in the years 1913–1939 to the New Jersey Experiment Station to complain of the pest. Records of three rhythmic cycles are not enough to permit an accurate estimate of the true length; but—so far as the evidence in this particular chart is concerned—the length is clearly in the general neighborhood of 9 to 10 years. A survey of chinch bug incidence covering 120 years, from 1820 to 1940, made by V. E. Shelford and W. P. Flint, also shows some evidence of a rhythm with an average length of about 9.6 years. The last three maxima in Illinois occurred in 1914, 1923, and 1934, these dates being each one year in advance for the maxima in tent caterpillars in New Jersey.

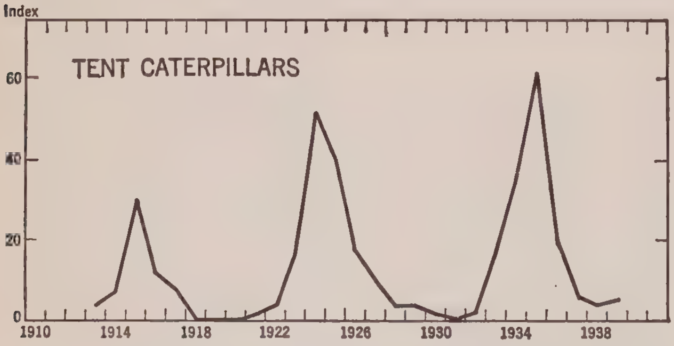

Fig. 3. Abundance of Tent Caterpillars

Letters of complaint addressed to T. J. Headlee, New Jersey State Entomologist, 1913–1939.

Similar rhythms of a little less than 10 years' average length have been discovered in the lives of such other animals as Canadian marten, fisher, mink, muskrat, and snowshoe rabbit, otherwise known as the "varying hare."

Interestingly enough, a rhythmic cycle of 9 to 10 years—perhaps 9⅔ years—has also been found by Professor Ellsworth Huntington, of Yale, in the rate of death from heart disease in northeastern United States.

Even more curiously, Huntington has traced a rhythm of this same approximate length in the variations in atmospheric ozone. The only records for ozone covering an appreciable length of time are those maintained by the Greenwich Observatory in London from 1877 to 1910, and those by the Montsouris Observatory at Paris for about the same period. (See Fig. 4.) The existence of a relationship between the death rate from heart disease and the volume of ozone in the air is of course not claimed by Professor Huntington to be proved, and needs further investigation, but the coincidence is provocative. Presumably the amount of ozone in the air depends largely on ultraviolet light.

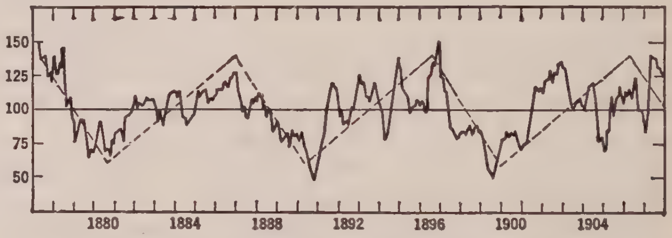

Fig. 4. Ozone at London (Kew) and Paris

Averaged 1877–1907. Seasonal (yearly) pattern and secular (long term) trend eliminated, smoothed by means of a seven-month moving average, and a regular 9⅔-year cycle added. (After Huntington).

Huntington concludes that the 9⅔-year cycle, whatever its cause or correlations, is basically a biological cycle. It is primarily evidenced both in animals and in men on the "animal," or health, level. (See Fig. 5.) Whatever the conditions giving rise to it, it seems in biological terms to be expressed basically through animal vigor.

There is another rhythm—not to be confused with the rhythm of 9⅔ years—of about 9 years' average length, or a little over, which as a physical rhythm shows up in electrical phenomena in the form of variations in the electric charge in the terrestrial atmosphere. Ellsworth Huntington states that this 9-year rhythm—as we shall call it—is revealed distinctly in the growth of the Sequoias in California, as shown by tree rings. We shall note later that a pronounced rhythm of 9 years or so also exists in important economic phenomena.

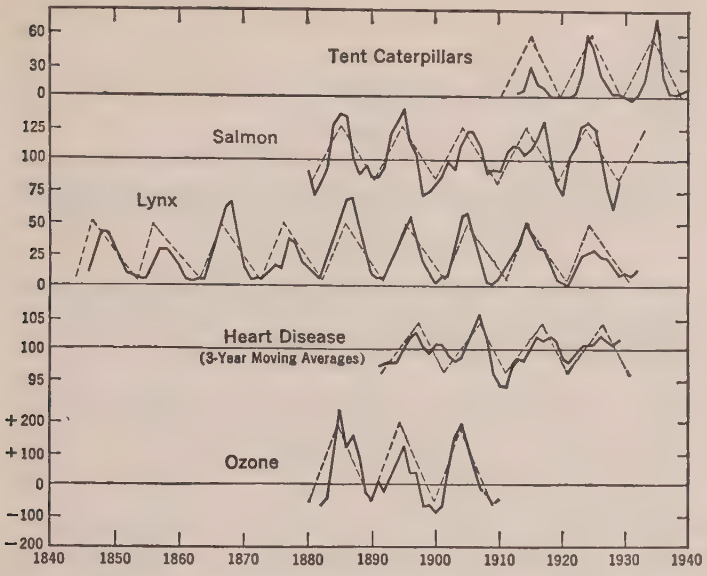

FIG. 5. THE 9⅔-YEAR RHYTHM IN INSECTS, FISH, MAMMALS, MAN, AND OZONE

The ozone curve shows the amount by which the ozone of any given year differs from that of the fifth preceding year, after secular trends have been eliminated (after Huntington).

Many other cycles have been noted at the biological level. One of approximately 4 years shows up in the number, migrations, and epidemics of lemmings, field mice, and the foxes that prey on them in regions as far separated as Norway, Newfoundland, and New York. (See Figs. 6–7.)

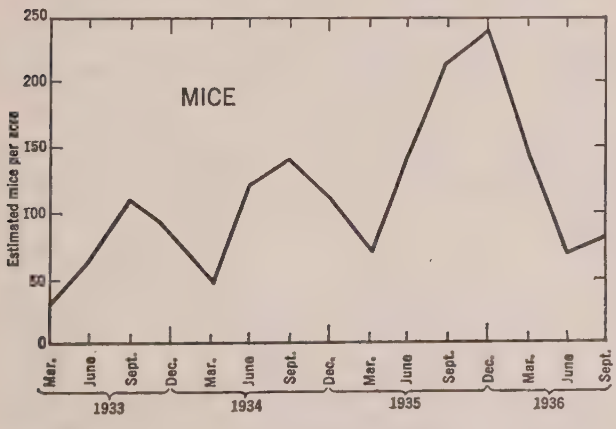

FIG. 6. ABUNDANCE OF MICE

Mouse population in a 20-acre field in central New York, 1933–1936 (after Hamilton). Chart shows seasonal pattern and one rhythmic crest. Previous outbreaks have been reported for almost every four-year interval since 1863.

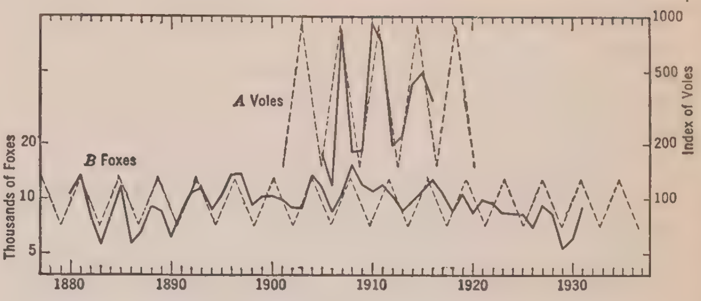

FIG. 7. VOLES AND FOXES

A. Abundance of Voles: Consignments of anti-vole materials sent out in second half of each year by the Agrikultur Botanische Anstalt of Munich, 1905–1916 (after Elton), together with a regular 3 5/6-year cycle. *Ratio scale.*

B. Abundance of Foxes: Number of foxes brought in for bounty in Norway, 1880–1931 (after Elton), together with a regular 3 5/6-year cycle. Note that the fox cycle reaches its crest a year after the crest of the vole cycle. *Ratio scale.*

Evidence that a rhythm of 41 months exists in the solar constant, as measured by the Smithsonian Institution, has been found by T. E. Sterne of Harvard University Observatory. An almost identical rhythm has been shown by Huntington to exist in the daily variability in atmospheric electricity (see Fig. 8).

We shall note later that a rhythm of seemingly identical length is evident in an extraordinary number of economic phenomena.

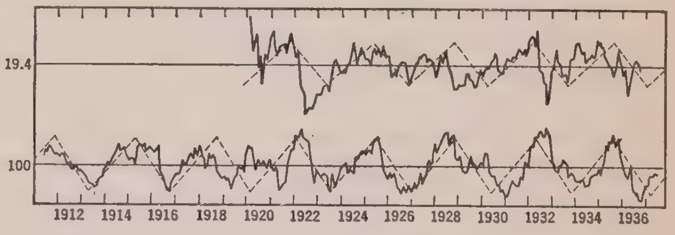

FIG. 8. SOLAR AND TERRESTRIAL DATA

Above, the Solar Constant. Below, Variability of Atmospheric Electricity at London (Kew and Eskdalemuir). Regular forty-one month cycles have been added. The electrical curve is based on percentages of a nine-year moving average with seasonal trends eliminated (after Huntington).

Evidence of the existence of other rhythmic cycles in solar phenomena has likewise been accumulated in recent years. In addition to sunspot rhythms of approximately 11 and 22 years in duration, investigators have isolated other cycles of about 9, 10, and 18 years. The solar constant, or the amount of heat from the sun received on earth, pursues a course different from that of sunspots, but also is subject to rhythmic variations. Our record of solar phenomena, however, is still too short to give us any complete certainty about the exact length of these rhythms.

Some students have laboriously sought to find correlations between such solar rhythms and weather, and also human economic activity. Some interesting evidence of correlation has been adduced.[*] The reader might here refer again to Fig. 8. But correlation does not prove causality, and data available are still too few to speak of interrelationships in terms of complete scientific certitude. Nor does the problem of interrelationship concern us at this point. One does not need to know the cause of night to know that morning will follow.

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[*] See, for instance, the *Quarterly Journal of Economics,* November, 1934: "Solar and Economic Relationships, a Preliminary Report" by Carlos Garcia-Mata and Felix Shaffner; also *Sunspots and their Effects* (Whittlesey House, 1937), by H. T. Stetson.

One of the earliest known rhythms which has interested men is the so-called Brückner cycle in weather. Sir Francis Bacon was one of the first to remark it; he wrote over three centuries ago:

> They say it is observed in the Low Countries (I know not in what part) that in every five and thirty years the same kind and suit of years and weathers come about again; as great frosts, great wet, great drought, warm winters, summers with little heat, and the like, and they call it the prime; it is a thing I do the rather mention because, computing backwards, I have found some concurrence.*

An Austrian, E. Brückner, gave his name to this 35-year cycle in 1891 by writing a book about it, showing clearly that the weather of Europe varies in cycles with an average length of about 35 years. Numerous other weather investigators have found evidence of a rhythmic cycle of the same length. Recent evidence has been accumulated for another weather rhythm of something more than 22 years in average duration.

David Brunt, an Englishman, published in 1927 an exhaustive study tracing some 34 different weather rhythms, with durations of from less than two years up. H. P. Gillette, as a result of a study of droughts, has concluded that one of the basic climatic rhythms is 7.47 years in length — a figure agreeing closely with a climatic rhythm of 7.50 years isolated by Brunt, and of 7.42 years as figured by Beveridge. Gillette multiplies his estimate of 7.47 by three to get a rhythm of 22.4 years, which agrees with a rhythm of that length isolated by Brunt in European weather, and is practically the dominant cycle of 22.3 years, as found by C. N. Anderson in sunspots with alternate cycles reversed.

H. H. Clayton has found a rhythmic cycle of 7.54 years in barometric pressures prevailing all the way from latitudes above 60° in Siberia and Iceland to the tropics at Calcutta. Gillette has concluded that other cycles could occur in both an upward and a downward series where three is either the multiplier or the divisor of 7.47. The multiple of three applied against 22.4 agrees rather well with a rhythm of 68 years isolated by Beveridge, and approximates a rhythm of 66 years which C. E. P. Brooks found evident in floods of the Nile. But it should be pointed out that it is easy to romance over interrelationship that ought to exist, and to attach importance to seeming coincidences that more careful measurements may prove to be entirely disparate phenomena.

Rhythms have even been found in the emotional life of human beings. Professor Rex B. Hersey of the University of Pennsylvania found that every individual tends to have his own emotional ups and downs in rhythmic cycles which may vary in periods, depending on the individual, from 2½ to 9½ weeks. Further studies conducted in both Europe and America have confirmed Professor Hersey's original findings, some of which are charted in Fig. 9.

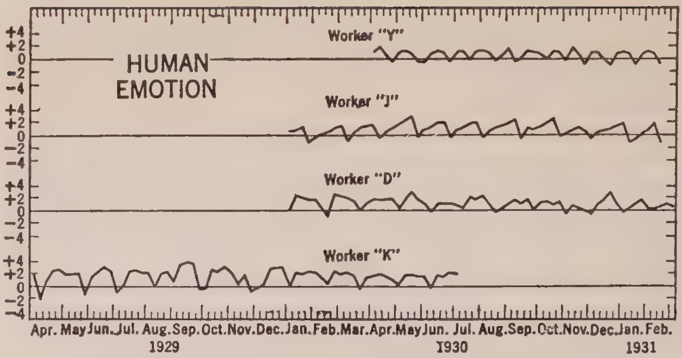

Fig. 9. Variation in Human Emotion

"Ups" and "downs" in the emotions of four male employees of the Pennsylvania Railroad Company (after Hersey). Reprinted from *Workers' Emotions in Shop and Home*, by Rexford B. Hersey. Copyright, 1932, by the University of Pennsylvania Press.

Rhythms have also been found to exist in the incidence of disease (Figs. 10–11). They also exist in growth (Figs. 12–13). They exist in solar phenomena (Fig. 14) and in terrestrial magnetism (Fig. 15). The purpose of a brief summary of this kind can only be to show briefly, for readers unfamiliar with the subject, the scope of some of the research work being devoted to the subject of rhythms in our environment.

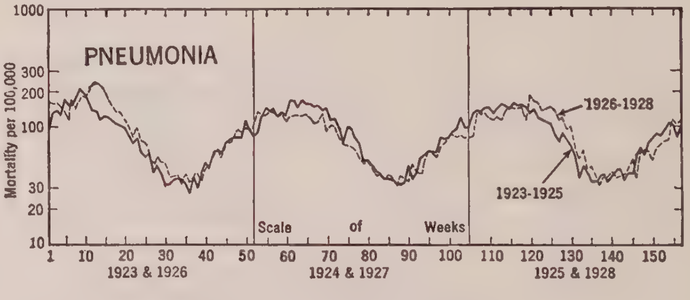

Fig. 10. Deaths from Pneumonia

Mortality per 100,000, 1923–1928 (after Metropolitan Life Insurance Company). Chart shows seasonal pattern and three-year rhythm.

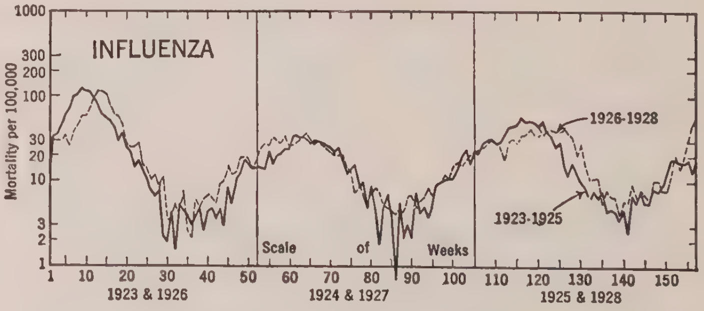

Fig. 11. Deaths from Influenza

Mortality per 100,000, 1923–1928 (after Metropolitan Life Insurance Company). Chart shows seasonal pattern and three-year rhythm.

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* As quoted by Ellsworth Huntington in *Mainsprings of Civilization* (John Wiley & Sons, Inc.), p. 455.

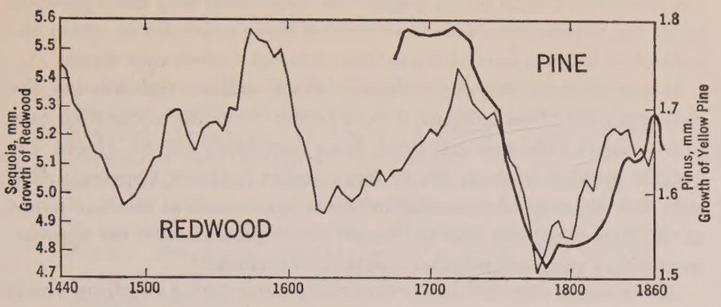

Fig. 12. Tree Growth

Long-period fluctuations in growth of Arizona yellow pine (Pinus) from 1620 to 1920, and of redwood (Sequoia) in Calaveras County, California, from 1390 to 1910. One-hundred-year moving averages of tree-ring widths are shown, with the Sequoia curve corrected for trend. A cycle of 150 years, presumably in weather, is disclosed. (After Thompson.)

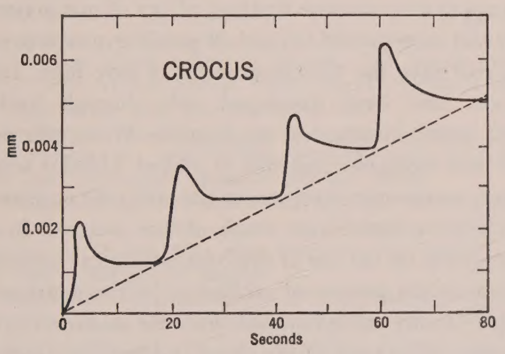

Fig. 13. Flower Growth

Short-period fluctuations in growth of the crocus. A crocus grows by little jerks, each with an amplitude of about 0.002 mm., every twenty seconds or so, each increment being followed by a partial recoil. (After Bose and Thompson.)

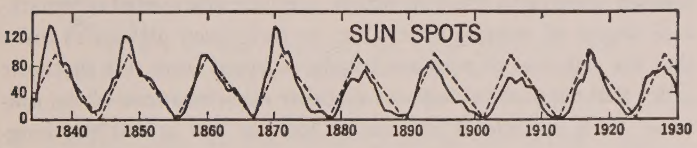

Fig. 14. Abundance of Sunspots

Sunspot numbers, 1835–1930. (Carnegie Institution of Washington.) A regular 11.4-year cycle has been added. Taken over a longer time-span, the period averages somewhat less.

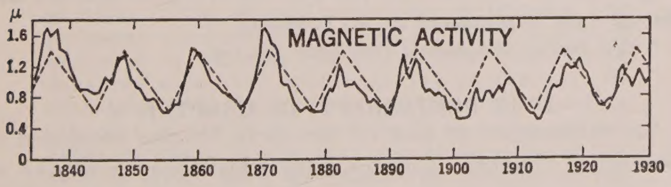

Fig. 15. Variation in Terrestrial Magnetism

Magnetic activity, 1835–1930. (Carnegie Institution of Washington.) A regular 11.4-year cycle has been added. Note the close correspondence with the curve of sunspot numbers.

The study of rhythm is of relatively recent origin; it has had to wait not only upon the compilation of statistics, but — even more important — the development of adequate methods for dealing with the statistics, and the funds with which to finance the work. It has been obvious almost from the beginning of research in this field that, in tracing the action of cycles in our world, we are dealing not with a few simple rhythms, but rather with a vast unknown number which interlock and interweave and yield themselves to discovery only through elaborate analysis.

Figures 16 and 17 from Warren and Pearson illustrate the complexity of this problem by showing how two simple rhythms may combine to create a rhythm unlike either of its components. Figure 18, also from Warren and Pearson, shows similarly how several such rhythms may combine into a synthesis. Later on, in Chapter

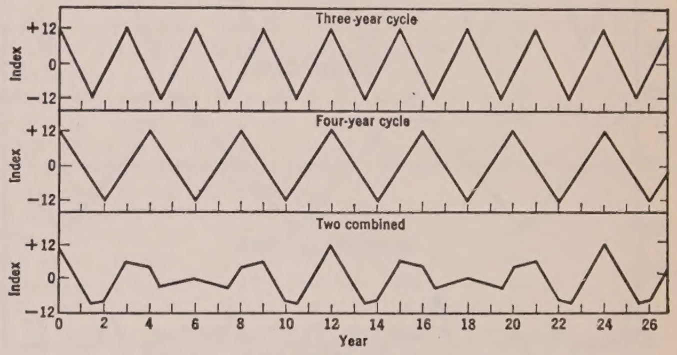

Fig. 16. Synthesis of Two Cycles

Regular 3-year and 4-year cycles, and the two combined. The sum of the two repeats every 12 years. (After Warren and Pearson.)

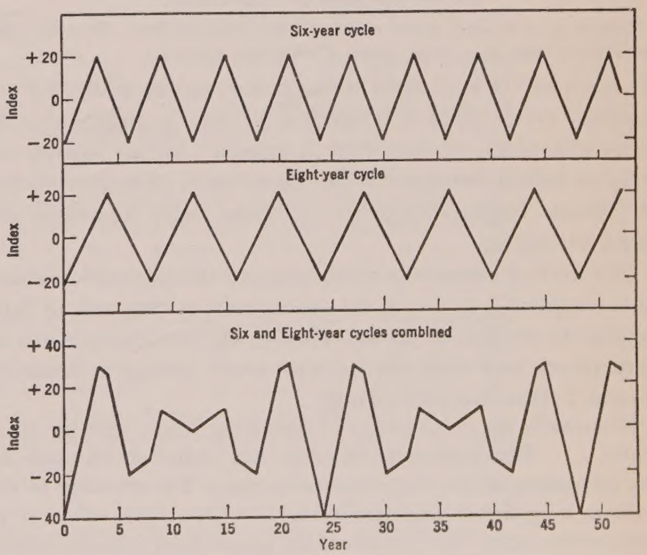

Fig. 17. Synthesis of Two Cycles

Regular 6-year and 8-year cycles, and the two combined. The sum of the two repeats every 24 years. (After Warren and Pearson.)

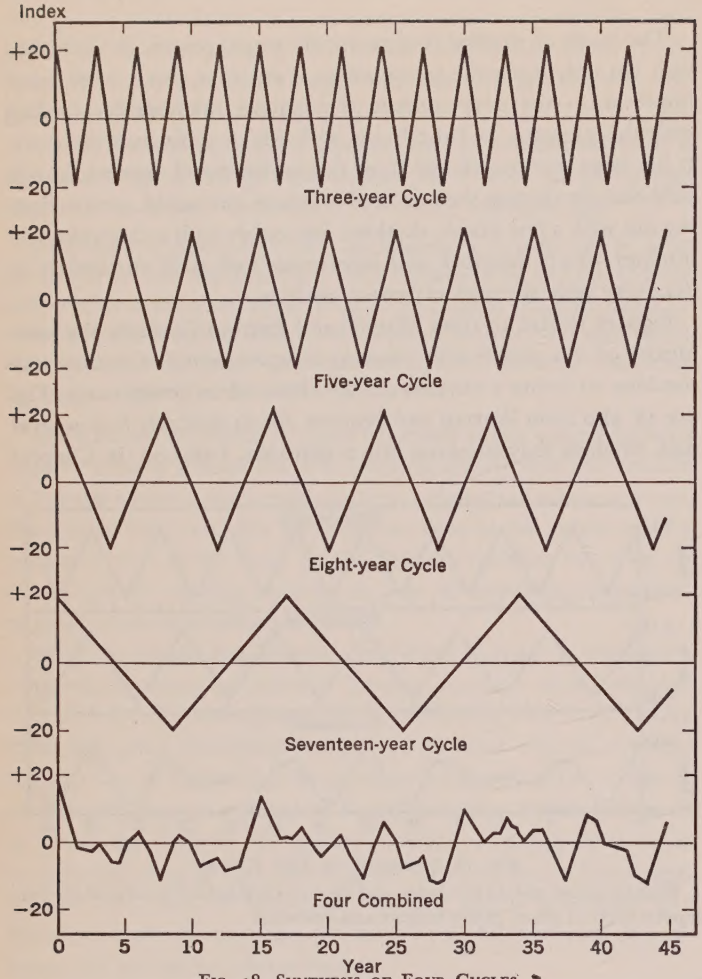

FIG. 18. SYNTHESIS OF FOUR CYCLES

Regular 3-, 5-, 8-, and 17-year cycles and the four combined. The sum of the four repeats every 2040 years. (After Warren and Pearson.)

XI, more will be said about synthesis and analysis in dealing with rhythmic cycles. Here it is sufficient to note in passing that the cycles with which we must deal in economic life are usually very complex indeed, being seemingly the synthesis of various rhythms of different lengths — together, of course, with numerous accidental variations.

The work of economists in analyzing such complexities is somewhat comparable to that of the astronomers in their task of determining the rhythms in the heavens — with the difference that the astronomers have been dealing with much simpler behavior. As Harold T. Davis has pointed out:

> Historically the investigation of time series began with the astronomers. . . . The astronomers, however, were much more fortunate than the economists in one very important matter. The structure of their series as it applied to planetary motion was determined by one or two dominating causes. The motions of the planets were influenced mainly by the excessive mass of the sun and secondarily by the mass of Jupiter. . . . Yet, in spite of this unusual dominance of the sun, one mathematical equation in the set that determines the motion of the moon reaches the incredible length of 170 pages. The economists may learn patience from the astronomers, who have needed three centuries to attain the control which they now have over the elements of their time series. . . .
>
> It is well known that the problem of three bodies — that is to say, the determination of the motions of three bodies — moving under their own gravitational influences has never been completely solved. Hence, the general problem of four, five or more bodies is almost hopelessly difficult. But when one dominating influence exists, such as the dominance of the mass of the sun over the masses of the planets, then the approximation to a complete solution is relatively accurate.*

As we move forward into examining some major rhythms which research has revealed at work in the economic life of our society, we shall do well to remember that we are adventurers in a field of new knowledge. We must be scientifically aware that all our conclusions are to be qualified by the knowledge that they are tentative. This is still no valid reason why we should not marshal them, and use them in daily life if they can be made applicable. Had we waited to apply the tentative findings of any of our major sciences until they had been proved beyond all possible question, we should doubtless still have the biological status of cave men. Indeed, all our sciences have been developed only through having their *hypotheses* tested in practical application. When the hypothesis worked, it was thereafter regarded as proved. Until it was actually put to work, no amount of argument was adequate to prove it.

As Davis has pointed out, much of our progress in isolating rhythms depends on the use of elaborate statistical methods which even yet are in the process of evolution. In the words of Harold Hotelling: " If only our tyrannical sun were smaller, the family of planets would enjoy some of the chaos of democratic societies, and the astronomer would be closer to the statistician. Science would have arisen later and statistics earlier."

The chaos that seems to prevail in the society we live in is doubtless one outcome of our own chaotic perceptions. As we have learned what to look for in nature, we have discovered a remarkable degree of existing order. But we have been pleased to insist that the activities of man are largely excepted from this rhythmic order that we note throughout all other manifestations of the universe. Such a credo is as pleasant for our ego as was the long-enduring geocentric astronomy of our ancestors. But the reader is invited to suspend it — however tentatively — and to consider with open mind some data which may lead to other conclusions.

In the pages that immediately follow, we shall consider four major rhythms that show up prominently in human activity, and discuss their implications in our economy.

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* *The Analysis of Economic Time Series*, pp. 1–2.

1953 POSTSCRIPT TO CHAPTER V

For refinements of some of the cycle lengths mentioned in the above chapter, and for many additional examples of cycles in natural phenomena, the reader is referred to *Cycles—A Monthly Report* and the quarterly *Journal of Cycle Research*, two publications issued by the Foundation for the Study of Cycles.

E. R. D.

GLOSSARY

Cycle, coming from a Greek word meaning circle, implies coming around to the place of beginning. Strictly speaking, in the word itself there is no necessary implication of regularity, but the word is often used loosely to denote rhythm or periodicity.

When the word cycle is modified by a time interval such as 6-year cycle, 20-month cycle, 17-day cycle, the phrase usually means a cycle that recurs with reasonable regularity. In other words, it denotes rhythm.

Rhythm, coming from a Greek word meaning measured time, implies a beat, or a tendency toward perfect regularity or periodicity. It is what we really mean on most of the occasions when we use the word cycle.

Cycle analysis, as we are using the term in this bulletin, should really be called rhythm analysis, as we are concerned with **rhythmic cycles**--cycles that recur with a beat.

Periodicity, in the strict sense, is the quality of being regularly recurrent. It is a quality not often found in nature. The ideal cycles which are often added to a chart to diagram a rhythmic cycle are true periodicities.

A **wave** is one single cycle or undulation. Waves have **frequency**, **amplitude**, **period**, and, at least when they represent harmonic curves, **phase**.

Frequency is the number of complete vibrations to and fro--i.e. waves--per second It is a term not used by cycle analysts when dealing with cycles that are over a second in length.

Amplitude is the extent of a vibratory movement measured from the average position to an extreme position; that is, it is the height or depth of the wave above or below the axis around which the wave oscillates.

Positive amplitude is the distance above the axis, **negative amplitude** is the distance below the axis, **overall amplitude** is the sum of the positive and negative amplitudes. Amplitudes may be expressed in absolute units or as a percentage of the value of the axis.

Period is the interval of time required for a periodic motion to complete a cycle and begin to repeat itself. It is the length of the wave from crest to crest or trough to trough or from some other point on the curve taken as the **epoch**. The **epoch** is the point on the curve chosen as the beginning of the wave. In physics and astronomy it is usually taken as the point where the curve crosses the axis on its upward motion, but it may be any other point as well.

Phase, in a simple harmonic curve, is the point or stage in the period to which the oscillation has advanced considered in relation to a standard position or assumed instant of starting. It is measured along the axis, usually in degrees. By extension of meaning, **positive phase** is therefore the part of the wave above the axis or trend, and **negative phase** is the part of the wave below the axis or trend. When the crests (or troughs) of two or more different series of waves come at the same time, the waves are said to be **in phase** with each other. When the crests of one series of waves coincide with the troughs of another series, the series are spoken of as in **reverse phase**.

A **simple harmonic curve** referred to once or twice above, is the curve you would get by tracing the motion of a pendulum upon a piece of smoked paper that was moving at uniform speed at right angles to the direction in which the pendulum was swaying back and forth. It is perfectly simple, regular, and symmetrical and, in mathematical study, is usually referred to as a **sine curve**. A single oscillation is called a **sine wave**.

A **rectilinear** or **saw-tooth wave**, on the other hand, is a wave the sides of which are straight lines; in other words, zigzag.

Trend is the tendency of data in a series to increase or decrease during a long period of time. The expression, "a long period of time," cannot be defined except relatively. If you are dealing with hourly figures, you might consider trend as the general direction over the past 30 or 40 hours. With yearly figures "trend" might mean the general tendency over the past 100 years or more.

An **average** is a typical value which tends to sum up or describe a number of figures. There are at least five different kinds of averages commonly used by statisticians; but the one which ordinary folk think about when they hear the word **average** is the one computed by adding all the items together and dividing the total by the number of items. Thus, if we have four items, 10, 12, 11, and 13, the average of these items is 10 + 12 + 11 + 13 (46) divided by 4, or 11½. An average of this sort is more accurately called the **arithmetic mean**.

An arrangement of numbers is called a **series**.

When the numbers with which we deal represent events which occur one after another in time, the arrangement is called a **time series**. Thus, in the example above, if 10, 12, 11, and 13 represent the price of cotton for each of four consecutive years, or represent the number of accidents on each of four consecutive days, you would call the numbers by this name—a time series.

You could still average the numbers and say, for example, that the average price for all four years was 11½ cents, or that during the period there was an average of 11½ accidents per day, as the case might be.

You could also say that the average price for the first three years was 11 cents, (10 + 12 + 11 (33) divided by 3) and that the average price for the last three years was 12 cents (22 + 11 + 13 (36) divided by 3).

A **moving average** is a succession of averages secured from a series of numbers by dropping the first number (item) in each group averaged and including the next number in the series after the group, thus obtaining the next group to be averaged, and so on.

Thus, when you averaged the first three numbers of our time series (10, 12, and 11) and got 11, and then dropped the first number (10) and added the fourth number (13) and averaged again and got 12, you were constructing a moving average

Because you were averaging three items at a time, you would call the result a 3-item or 3-term moving average. If the items represented yearly values you would call the result a 3-year moving average. If the items represented daily values, you would call the result a 3-day moving average.

The **moving total** is the series of successive totals from which the moving average is computed. For example: When , above, you added 10, 12, and 11 to get 33, and then added 12, 11, and 13 to get 36 (as a step in the task of getting 11 and 12, the two terms of the moving average), you were computing a moving total.

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P.S. An Example: The first job that came as a result of our September ad was a 22 by 34 inch display piece printed on heavy stock, three colors. The price for 500 copies was only $60. The amount of savings is well worth investigating.